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Electricity Supply: The Government Scheme.

ON Friday last week the Prime Minister delivered the long-promised statement with regard to the policy adopted by the Cabinet for the development of electricity supply in this country; and on Monday the Electricity Commissioners imparted further information on the subject to representatives of the technical Press. We now, therefore, are in possession of the main outlines of the scheme, which will be further elaborated in the Bill which is to be introduced into Parliament early in the new Session.

We are very glad to find that on many points we are in full agreement with Mr. Baldwin. To the facts which he quoted we take no exception, and the personal opinions which he expressed, as distinct from the proposals which, we take it, were formulated by his advisers, are in accordance with those which we have repeatedly put forward in these columns. For instance, he recognises that electrical power in itself does not afford the solution of industrial efficiency; he rightly stated that exaggerated statements had been made, and that cheap power alone could not revive industry. We also welcome his realisation that a good selling organisation is essential to the success of the electricity supply industry; that, in our opinion, is a fundamental requirement—but unfortunately the scheme makes no proposals for providing it. Again, Mr. Baldwin admits that the necessity for the standardisation of frequency is not universally accepted; an isolated area has little to gain from it. And lastly, he stated that improvement of the load factor was of vital importance—a view which cannot be too strongly emphasised.

Turning to the scheme, essentially, it involves the creation of a central executive authority which shall establish a huge network of interconnecting mains between all the large power stations, existing or contemplated, and shall become a "middle-man," purchasing electricity from the producers and selling it to the distributors. In one respect the constitution of this authority will be as warmly approved by the industry as it was by Mr. Baldwin's audience—namely, in that it will not be a Government department. It will, however, be vested with compulsory powers of unprecedented scope; it will be able to "bring everybody into line." If this result is achieved, we may hope at last to see the end of

the parochial system which Parliament imposed upon this country by the legislation of the 'eighties, and which for 40 years has clung round the neck of the industry like Sindbad's Old-Man-of-the-Sea; but the Board is set a gigantic task, and will have an army of vested interests arrayed against it. Important national interests must necessarily over-ride local claims, but we trust that full justice will be done to all those undertakers, whether municipal or company, who have honestly endeavoured to provide the public with that service for which they were granted a monopoly by Parliament.

As we have surmised in these columns, it is clear that the provision of capital for the use of this new authority has been the perplexity of the Cabinet; it would now seem that the Cabinet has found the problem insoluble. Mr. Baldwin states that the Board must find the capital for itself; to enable it to do this, a Government guarantee will be provided. We here find one of the contradictions that appear in his speech. He says that the outlay on interconnecting mains will be remunerative, and that the cost of standardising frequency will be fully off-set by economy in the cost of generation; he indicates that the Board must earn interest and sinking fund on its expenditure, and that the surplus (if any) will go to reduce the charges to the distributors. If the outlay is so sure to be remunerative, why seek the assistance of the Exchequer? and on the failure of that quest, why grant a Government guarantee? Unfortunately, we see no hope of a return from long interconnecting mains—save at the cost of the consumers—and as for the standardisation of frequency, we remember that Mr. Philip Snowden, as Chancellor of the Exchequer, declared this to be in the national interest rather than that of the undertakings concerned, which could not be expected to incur a heavy and unremunerative outlay. The Board will be a middle-man with a profit to make to cover interest and sinking fund, which will constitute a new charge on the supply of electricity, thus making three profits between the coal pile and the consumer's terminals instead of one or two as at present. These charges, we are told, will be fully off-set by economies in generation; we fear that the hoped-for economy, on the contrary, will be more than off-set by the additional charges.

According to the invaluable statistical Return of the Electricity Commissioners, in 1922-23 the average revenue of all undertakings was 2.08d. per unit sold, whilst the cost of generation was 0.54d. per kWh generated—say, 0.67d. per kWh sold, the cost of fuel being about 0.40d. There are many electricity works of quite small output, whose total revenue per kilowatt-hour to-day is less than 1.5d.; on the other hand, many large undertakings, some of which are interlinked with other undertakings, are charging over 3d. a unit on the average for all purposes. As we have shown on previous occasions, saving in fuel cannot possibly affect the price materially except in bad cases. Only by reducing capital charges and improving the load factor can the price be effectively lessened. It is claimed that interconnecting mains will dispense with a large amount of stand-by plant, and will improve the load factor; but a large proportion of the existing stand-by plant is of obsolete and inefficient pattern, and the mains must be paid for, whilst little improvement of load factor can be effected by coupling large stations with similar load curves, and the loss in transmission over long mains must not be ignored. The suggested resultant economies in generation are therefore somewhat problematical, and it is not even certain that undertakings owning very large power stations can supply electricity more cheaply than those of quite modest dimensions. For example, Manchester, with plant of 209,000 kW, receives 1.32d. per kWh, whilst Luton, with 12,000 kW, receives 1.10d. It is true that the large stations use fuel more economically, and with a high load factor can supply energy at a low price, but as Mr. Baldwin most truly said in his address, the great need is to reduce the cost of distribution, and to cover fresh areas—yet the "single purpose" of this scheme is to reduce the cost of generation. The former is greater than the latter, and it is of little use to attack the minor factor whilst leaving the major severely alone. No wonder that the Prime Minister did not think that this scheme would be the salvation of industry!

The fact is that the politicians are obsessed by the one idea of cheapness—always cheapness—failing to realise that electricity supply, for power purposes at any rate, is already cheap in our great industrial areas. What is required is development, and it would be far better to spend a large sum (but modest in comparison with the millions required for this scheme) on the education of the public to the advantages that they can derive from the free and even lavish use of electricity, than to sink enormous capital in mains and in replacing plant of non-standard frequency. Over a year ago we expressed the hope that "the technical advisers of the Government will recommend a sane and sound policy, avoiding an unprofitable outlay, but spending freely where it is wise to do so." We do not feel that the scheme before us fulfils that hope. We fear that the Government has tackled the wrong end of the problem; it is embarking on an unprofitable outlay.

Let it be understood that of the interlinking of adjoining power stations we cordially approve; our objection is taken to the erection of long mains connecting widely separated areas. In countries where water power or coal is available only in remote localities, such long mains are indispensable, but in this country that condition does not obtain—coal is available almost everywhere, and there is no necessity to transmit large blocks of power over great distances. Lancashire, already supplied with cheap power, will gain nothing from connection with the North-East coast or the Midlands, and *vice versa*.

The large expenditure contemplated would be more profitably devoted to assisting the electrification of our railways, which would at the same time carry electricity supply into the rural areas.

Research in the United States.

A BULLETIN has been issued dealing with the expenditure of the United States on research; her industries spend about 35 million dollars per annum on co-operative laboratory research, and it is estimated that this results in a saving of approximately 500 million dollars. By those who make use of the facilities offered, the outlay is regarded in the light of a sound and profitable investment; they find that it pays them extremely well. It is deplored that the value of the service proffered is not universally recognised; there, as here, there are powerful interests which stand aloof, showing that after all Britons hold no monopoly of stupidity. What is really of moment to British industries is not the fact that certain Americans are less alive to their opportunities than is supposed, but that the majority are alert and progressive, in no direction more so than as regards their attitude to research.

In many instances there is hearty and effective collaboration between industrial plant and university, between workers in applied and pure research. It is sufficient to read the records of such manifold and valuable researches as are described from time to time, for example, in the pages of the (American) *General Electric Review*, to realise how important a part scientific inquiry for practical ends plays in the development of the staple American engineering industries. Research is with them no luxury stunt; it is deemed to be a sheer necessity.

British engineering must not be allowed to lag behind in this respect; it will do so to its own increasing detriment. Much good work has been done, and is being done, alike at the N.P.L. and in commercial laboratories. Various research associations are holding their own, if doing little more. One or two, such as that of the electrical industries, are forging ahead. Taken as a whole, however, there is occasion for serious stock-taking. Much better things are possible; much closer attention to the real needs of the situation is called for.

As a nation we are faced with keen and well organised competition. Abroad the scientific spirit, as an aid to industry, is freely cultivated. British steel manufacturers, for example, have a hard fight before them. Not less, but more reliance upon the researches of expert metallurgists is a vital necessity. We have to hold our own—nay, to excel.

Thus the prime requisite is that Britain shall emulate her over-the-seas cousin, and in capitalising research, that she shall do so with no niggard hand.

The Protection of Investors.

THE frequent references in our own columns and in those of certain financial dailies, warning the public to be on their guard against invitations received through the post to invest in certain extremely weak and undesirable electricity supply companies, have not succeeded in entirely stopping the issue of such invitations. As we have repeatedly said electrical men (and women) who are familiar with electricity supply matters and the main essentials to success of electricity undertakings, are unlikely to be led astray by primitive and obviously misleading prospectuses, and their peculiarly-worded accompanying communications; the victims are seemingly innocently-minded and unsuspecting individuals who have no occasion to read either the electrical or financial Press, and who in their effort to make a slight increase in their meagre incomes in these hard times have reposed their trust in unknown and unworthy advisers, and have awakened after a short time to find that they have lost their money. It is in the interest of electricity supply and, indeed, all forms of legitimate enterprise that everything possible should be done to lessen the activities of postal "share-pushers." The President of the Board of Trade was questioned on the subject in the House of Commons recently and he undertook to bring the subject before the Committee which is considering possible amendments to the Companies Acts. Mr. Waldron Smithers who put the question has been interviewed by the *Financial Times*, and he has mentioned the possibility of introducing a licensing system which would enable a "black list" of undesirable circularisers and of doubtful shares to be kept. Only expert investigation can decide how far such a system could prevent the wholesale victimisation which appears to be prevalent at present. In one part of the interview with Mr. Smithers it is revealed that one method which has been employed for inducing people to part with their life savings has been to offer shares "in a particularly good electrical concern" at slightly under market price. "On payment of 1s. fee at Somerset House the names of people interested in electrical companies are ascertained and they are circularised to buy the shares in the company of standing. On application prospective buyers are informed that the shares which were on offer have been sold, and the firm then tries to interest them in something else it is anxious to dispose of." Mr. Smithers advocates that the widest publicity should be given to such methods. We fully agree, and if only our highly organised newspaper Press from one end of the Kingdom to the other would shoulder this responsibility it would be serving the real interests of its millions of readers in a way which is open to nobody else, and bring to itself far greater credit than is due to it for sensational and kindred stunts.

Registered Contractors.

WE wish to direct the attention of our readers to the very interesting article relating to the position and progress of the movement for the registration of electrical contractors which appears on pages 130 and 131 of this issue. We are indebted for this statement to Mr. P. V. Hunter, C.B.E., the Chairman of the Executive of the National Register. It will be observed that down to December last 804 applicants had been admitted, and 50 others were then under consideration. But it will also be seen that there are still a large number of eligible contractors who are, for some reason or other, holding back. Mr. Hunter tries to clear away some of the sources of misunderstanding that exist regarding the objects of the movement, and we trust that the publication of his article will stimulate interest and increase the rate of applications for membership. In another part of this issue we also give publicity to the list of contractors whose names have been added to the register since the summer of 1924.

Coal, Power, and Transport.

ON Thursday last week a grandiose scheme for the co-ordination of coal mining, the generation of electric power, the production of coke and smokeless fuel with recovery of the attendant by-products, and transport, was submitted to the Royal Commission on the Coal Industry by the Miners' Federation. The scheme essentially involved the nationalisation of all these important industries under the control of a Government Commission endowed with autocratic powers, attached to the Board of Trade. In place of the Electricity Commission there would be a "Power and Transport Commission" consisting of six full-time Commissioners, which would deal with the development of power (including coal) and transport; there would also be a "National Coal and Power Production Council," to control the organisation of the industry as a board of directors, and provincial councils, pit and works committees, and a consumers' council were provided for, as well as a separate export commission which would purchase coal and export it. It appears that the miners themselves would be heavily represented on these various bodies.

The collieries would be purchased at market values, by the issue of Government stock, or by a guaranteed national loan.

The scheme included the generation of electrical power at or near the mines, largely from refuse fuel, and the use of gas for producing electric power, as well as the adoption of low-temperature carbonisation, was contemplated.

One cannot but admire the calm effrontery with which this preposterous proposition was laid before an astonished public. The scheme was said to represent the views of a joint committee of Labour organisations; it is impossible to believe that it was ever meant to be treated seriously, and the only apparent purpose with which it was launched must have been to divert attention from the fact that the miners had put forward no concrete proposals for restoring the coal mining industry to a healthy condition. It has expired in a burst of laughter.

The Market in the Dutch East Indies.

ON another page is printed a statement showing the imports of electrical and allied material into Java and Madeira. It will be seen that in spite of the importance of the market in these two prosperous islands of the Dutch East Indies, the share of Great Britain in the electrical trade is practically negligible. Yet the purchasing power of Holland's East Indian possessions is growing rapidly owing to their exportable surplus of many agricultural and mineral products, *e.g.*, rubber, sugar, tobacco, cinchona, coffee, tea, oil, and tin, for which the world's demand is either increasing steadily or at least very stable. The population of the islands is roughly fifty millions. Of these about 35 millions are to be found in Java, among them over 135,000 Europeans. Whilst the figures to which we draw the attention of British exporters desirous of finding promising outlets for their goods, refer to the most populous and highly-developed portions of Holland's colonial empire, there are other regions which show great promise of agricultural and commercial expansion. In Sumatra vast schemes are being undertaken for the cultivation of rubber, coffee, tea, and cinchona, whilst in South East Borneo iron ore deposits have attracted the notice of capitalists. In the Celebes there is a project for utilising water power in the manufacture of fertilisers.

It would therefore appear that the market is worth the serious attention of British electrical manufacturers and traders.

Another Automatic Converter Sub-Station.

Demonstration of Reyrolle-Mather & Platt Equipment at Park Works, Manchester.

THAT the advantages of the automatic operation of converter sub-stations are being appreciated is evident from the fact that, whereas four years ago no such plant existed in this country, there are now a number in service, and at least six firms have manufactured, or are prepared to supply, equipment of this class. The increasing importance that this type of plant is assuming offered an opportunity last week of examining with much interest a rotary-converter equipment in-

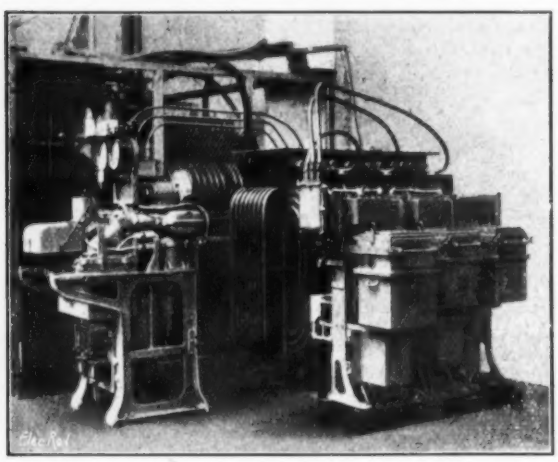


Fig. 1.—H.P. Switch, Transformer, and Starter Panels.

stalled at the Park Works, Manchester. The sub-station comprises a 500-kW self-synchronising rotary converter by Messrs. Mather & Platt, Ltd., with completely automatic control gear by Messrs. A. Reyrolle and Co., Ltd., and a transformer by Messrs. Ferranti, Ltd.

Like other automatic control equipment produced by Messrs. Reyrolle, this is an entirely metal-clad job with a minimum number of relays, all of fundamentally simple type. The main h.p. switch panel is shown in fig. 1; it consists of a standard 6,500-V, compound-filled, metal-clad panel of the horizontal draw-out type "C," with a normal rupturing capacity of 75,000 kVA, provided with a 3-phase potential transformer on the incoming side, low voltage, overload, and earth-leakage protection with t.l. fuses. A simple drive by a small 3-phase motor standing on top of the bus-bar chamber makes adequate provision for electrical operation without interfering either with the draw-out principles or with hand operation when required.

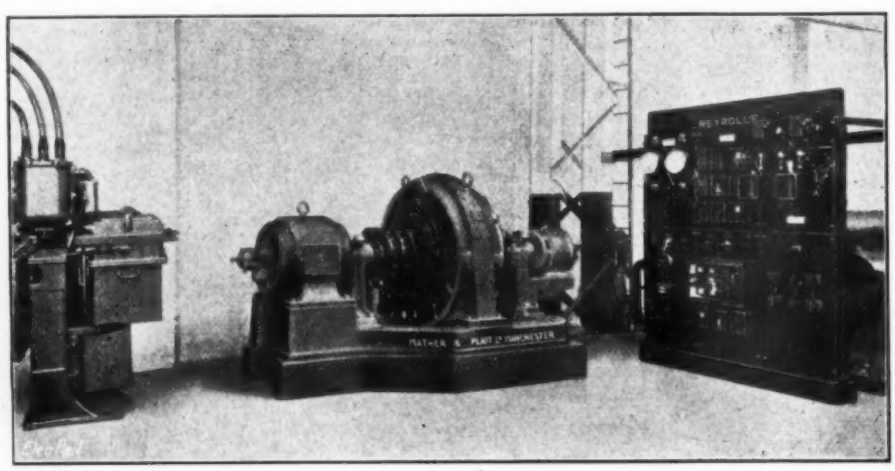


Fig. 2.—The Park Works Automatic Rotary Sub-station.

The Ferranti transformer is placed immediately behind this switch, and the starting switchgear is arranged directly alongside the l.p. terminals of the transformer in a direct line between it and the converter, thus minimising the length of cable required for the l.p. connections and avoiding awkward cable runs. The starting gear (seen on the right in fig. 1) consists of three neat metal-clad, oil-immersed switch pillars of the Reyrolle 400-V mining class, arranged in line and provided with mechanical interlocks and solenoid operation.

Messrs. Mather & Platt's standard method of starting has been incorporated in this equipment; the system is particularly suitable for automatic control owing to its simplicity, the certainty and smoothness with which synchronising is effected, the ease with which the polarity can be controlled, and to its independence of external and internal variables, *e.g.*, temperature. It is not necessary to lift the d.c. brushes during the starting period, so that not only is one source of complication removed, but it becomes possible to fit the standard M. & P. simple and rigid brush gear with all springs and flexibles thoroughly shielded.

On the d.c. side a standard 3-wire machine panel with automatic reclosing circuit breakers has been provided, and the equipment feeds in to the d.c. shop network in parallel with the manually-operated equipment installed in the firm's main sub-station some hundred yards away. The automatic control panels are shown in fig. 2 mounted alongside the d.c. machine panel; one carries the indicating instruments and manual controls without which no Reyrolle automatic equipment is turned out; on the other panel is mounted the whole of the relays required for starting the plant by low voltage on the network, or through the agency of an astronomical time switch and the Reyrolle standard master timing device shown in fig. 3.

This is set to prevent the switch being started by momentary kicks; it energises the closing motor on the h.p. oil switch through the operation of the master relay. This operation cannot be effected, however, unless the a.c. low-voltage coil is first energised, its circuit being completed through all the main protective devices and through the auxiliary "police" switches indicating the position of the various starting switches and the d.c. circuit breaker. As the closing motor is a 3-phase machine, the fact will also be appreciated that it will not operate to close the switch if one phase happened to be lost, thus providing against single-phase operation, a further safeguard in this respect being provided by connecting certain of the a.c. relays to opposite phases.

When the h.p. switch is closed, the transformer is energised, and the starting motor of the rotary converter is connected to the l.p. side of the transformer. The machine accordingly begins to accelerate and, the correct polarity having been determined by a suitable relay, the l.p. transformer connections are transferred

to the second (or synchronising) step; the machine now runs up to full speed, the main field winding is adjusted to the correct strength, and the machine brought into synchronism. The operation of the relay provided to prove synchronism closes the main (or running) contactor on the l.p. side, cutting out the starting motor, opening the contactors controlling it, and connecting the l.p. transformer leads direct to the slip rings; at the same time an adjustment is made to the field strength to give normal no-load voltage on the d.c. side, and

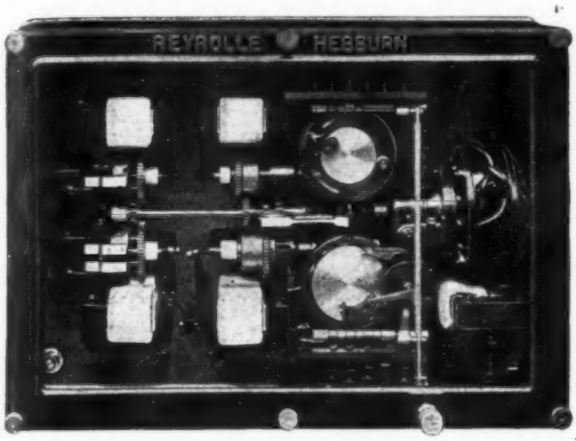


Fig. 3.—Master Control Device.

the discriminating relays controlling the operation of the main machine circuit breaker are put into operation.

If the load proves to be within the limits of the machine, these circuit breakers close, and the load is at once picked up. Underload and overload d.c. relays govern the operation of the set through the medium of the master timing device, which also incorporates in one common case all the time elements required for the whole equipment. In the event of a failure to synchronise for any reason, the set will shut down and will automatically start a second, and then a third, time before finally locking itself out.

The time taken to get the rotary on load is remarkably small, being considerably under one minute. The converter is equipped with an exciter and with bearing-temperature and overspeed devices of Messrs. Mather and Platt's own design and manufacture. The polarity is at present determined by the exciter, but an alternative scheme was demonstrated to us which allows of the correct determination of the polarity without the use of an exciter.

A feature of Messrs. Reyrolle's equipment is that each individual piece of main apparatus controlling the plant is not only provided with a handle, but is definitely made for normal hand operation, as well as fully automatic. This is a point which will be appreciated, for it provides easy facilities for overhaul and efficient examination by the inspection staff. The relays are all of the plain electromagnetic type, with lift and fall armatures carrying visible contacts, and are enclosed in dust-tight cases of uniform design with glass fronts to show the interiors. The master timing device illustrated in fig. 3 is an ingenious adaption of simple principles, and comprises a single main shaft driven at a speed of approximately three revolutions per minute, to which are connected, by electromagnetic clutches controlled by the various relays, simple trains of gearing which drive graduated cams that operate robust visible contacts. The range of timing offered by this piece of apparatus is such as to provide an ample margin to satisfy the varying conditions met with in practice.

In conclusion, it may be remarked that we were also shown a smaller converter set in the works which is completely controlled from a distant point with the aid of pilot wires and switching apparatus of the type made by Messrs. Bertram Thomas, similar to that illustrated in our issue of October 17th, 1924.

The Comines Power Station.

A French Central Station using Pulverised Fuel.

By THEODORE RICH.

(*Concluded from page* 88.)

Water Services.

In many parts of Flanders the question of feed and other water supplies gives rise to difficult problems, especially as nowadays a steam station has so many auxiliary services requiring water besides the boiler feeds; for instance, the cooling of air which passes through the generators, the cooling of the turbine circulating oil and that of the transformer coils, also supplies of drinking water. There are two sources of water supply at Comines—one from the River Lys, drawn from the circulation pressure pipes, and the other a tube well sunk 190 metres (623 feet) deep, into carboniferous limestone. The former water, in addition to its use for condenser circulating purposes, is used for the cooling of the evaporator auxiliary condenser and for fire service. The well water is used to supply the workmen's cottages and the station with drinking water, and can be used as an alternative for other services. A pump house is fitted on the ground floor, containing centrifugal pumps, which are used for the different services: it also contains the distilling plant. Three tanks are arranged—two of 65 cubic metres (2,280 cu. ft.) capacity and one of 20 cubic metres (702 cu. ft.); the two former are used for raw river or well water, the latter for distilled water. A water softener of the Demouly-Lamy type, of a capacity of 40 cubic metres (8,800 gallons) per hour is arranged to work intermittently: the water is then passed into a settling chamber of 300 cubic metres (9,350 cu. ft.) capacity. A tank of the same capacity is fed by the distillers, this water being used for cooling the transformers and reactances, the cooling of this water being by means of sprays.

There are four Sulzer centrifugal feed pumps; three of these are driven by high-pressure steam turbines and the fourth is operated by a three-phase motor running at 220 volts. Each has a capacity of 200 cubic metres (4,400 gallons) an hour under a pressure of 23 kg. per sq. cm. (327 lb. per sq. inch). These pumps have their suctions under head in the feed tanks, which are supplied from the condenser. The pumps have excess pressure valves which release back into the feed tanks.

In order to eliminate trouble through scale in the boilers or in transformer and other cooler coils, a Kestner multi-effect distiller is arranged, which will be described at a later date. The steam supply for the heating comes from the exhaust of the Sulzer turbines which drive the feed pumps. The output of the distiller is passed through a Lea Recorder.

Piping System.

The steam pipes are of solid drawn steel, with circular loop expansion rings. There are two independent lines of mains running at the back of each line of boilers, terminating in steel separators, and a double header running along a covered alley way between the boiler

houses and the turbine house; there is a duplicate supply up to the turbine separators. The pipework is covered with a composition made up of 85 per cent. Newalls sulphate of magnesia and 15 per cent. fibrous asbestos; the insulation of the pipe joints is made removable. Steam meters of the type made by the American General Electric Co. are fitted. The feed pipes to the economisers form a double ring; they are fitted with Worthington-type water meters.

The Driving of Auxiliaries.

In accordance with a practice very usual in France, separate generating sets are provided for the driving of the auxiliaries; two Rateau-Schneider-Thomson-Houston turbines have been installed running at 3,000 r.p.m., one of 3,500 kW and the other 5,200 kW (these were illustrated in fig. 14, p. 62, in the issue of January 8th). The generators are wound for 10,500 volts, and are connected to a special auxiliary switchboard placed quite apart from those of the main station.

The auxiliary bus-bars are in duplicate, and in case of accident, by means of oil switches, they can be connected to a set of duplicate local supply bus-bars, which are supplied by step-down transformers 45,000/10,500 volts from the main station bars, these local supply bars being connected to certain outgoing feeders at 10,500 volts.

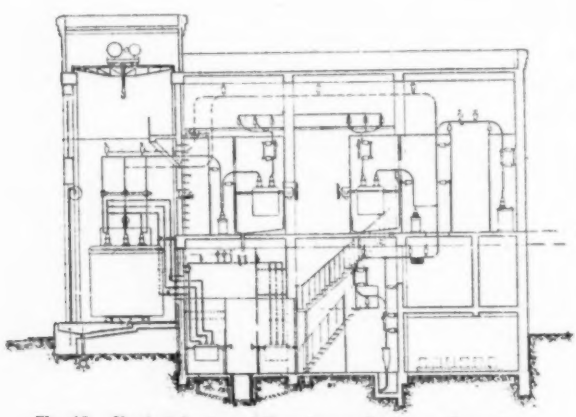


Fig. 18.—Vertical Section of Transformer Station at Tourcoing.

To these auxiliary bars are connected 10,500/220-V. 2,000-kVA transformers for the operation of those auxiliaries which are run on three-phase current; for instance, the fans for the chain-grate stokers, the Prat induced-draught fans, and the pulverisers; a set of two 1,000-kVA transformers for the river pumping station; and a set of transformers for operating the rotaries. The station and other overhead travellers, the coal transporters, elevators, and belt conveyors are operated with direct current at 230 volts from two 500-kW, 1,000-rev., six-phase rotary converters, shunt wound and fitted with centrifugal trip gear. For the emergency lighting and the operation of the auto-switchgear, a 350-ampere-hour, 110-volt iron-nickel battery is provided, charged by means of a 12-kW asynchronous motor-generator.

Transformers and Switchgear.

A house for transformers and switchgear runs the whole length of the main buildings; it is 28.4 metres (33 ft. 3 in.) wide, and is separated from the main bay of the turbine house by a passage arranged so that the transformers can be run on to a trolley from the cells in which they are placed and run out of the building. Each cell is fitted with roller shutters. This can be seen from the section of a similar building, fig. 18. The operating board is placed above this passage.

Each turbo-generator is connected to three single-phase transformers, each of 10,500 kVA, 10,500/45,000 volts; the low-pressure side being in delta and the high-pressure in star.

There are three sets of bars—one for coupling, one set of main bars, and an auxiliary set. Each group of step-up transformers is connected to an automatic oil switch fitted with differential relays for the protection of each alternator, and a wattmeter-type relay which comes into action in the event of bad paralleling. Connection is made by three remote-controlled switches to the three sets of bars, the connection to the coupling bars being through reactances. The main bars are

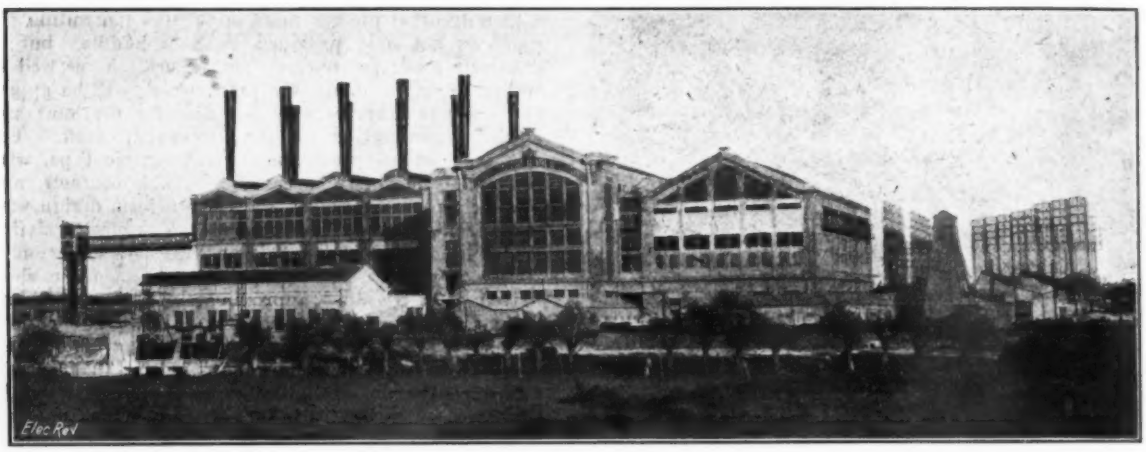


Fig. 17.—General View of Comines Power Station.

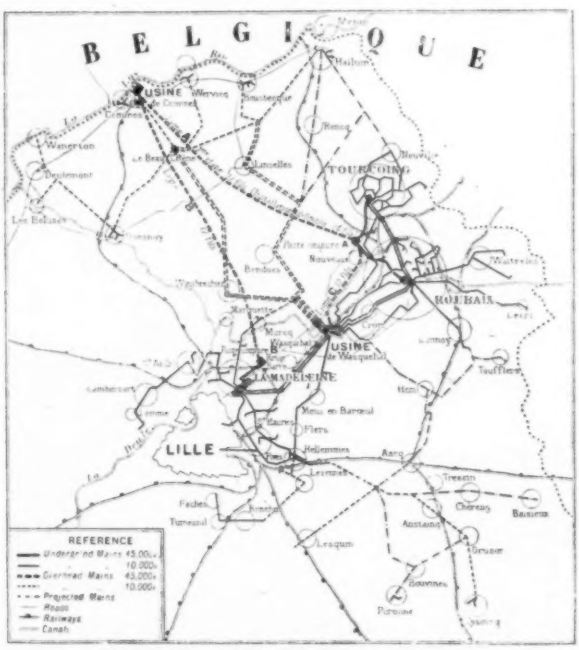


Fig. 19.—Plan of the Network of the Company.

sectionalised so that, if desired, the Roubaix-Tourcoing section can be run separately from the Lille section. Each feeder is connected to the main and auxiliary bars by means of two automatic switches; protection is given to each feeder by means of water-jet limiters and horn dischargers fitted with liquid resistances. With the aid of the auxiliary bars, should the automatic switches on a feeder come out, it is possible, by means of a regulating transformer, gradually to raise the pressure on it to see if there is a permanent fault.

The electrical end of the main turbo-generators, the transformers, and the switchgear and appliances were supplied by the French Thomson-Houston Co.

Auxiliary Buildings.

A workshop about 100 ft. long by 33 ft. wide is provided for general repairs; it contains tools and equipment for general electrical and mechanical work, with a forge, coppersmiths', and woodworking shops. In an annexe to the main building lavatories and shower baths are fitted. In view of the difficulty of getting accommodation in the neighbourhood, a number of houses have been put up for employés, each block consisting of four dwellings, each with a strip of garden.

Transmission Lines.

Fig. 19 shows the trunk lines. In the direction of Roubaix-Tourcoing there are 12 stranded conductors of copper, 105 sq. mm. (0.163 sq. in.) section. Fig. 20 shows the type of standard used, the normal span being 65 metres; the standard is set in a block of concrete. The top conductor is fixed about 38 ft. and the lowest about 30 ft. from the ground. The main uprights are made up with four braced angles 60 × 60 × 6 mm. (2.36 × 2.36 × .23 in.), on a base at the ground line of 1.200 metres (3 ft. 11 in.). The earth wire is of double-galvanised stranded steel of 35 sq. mm. (0.05 sq. in.) section. The insulators for the 45,000-volt lines are tested to 140,000 volts in the dry. The distance between the conductors is 1.25 metres (4 ft. 1½ in.) horizontal and 1.35 metres (4 ft. 5 in.) vertical. A wire guard is put up between each section of six conductors at the supports, so that one section can be got at safely while the other is alive.

There is a 6-conductor line towards Lille, which has running alongside it most of the way a similar line built by the State to link up with a main trunk line running between Valenciennes and Lomme, which is to the west of Lille.

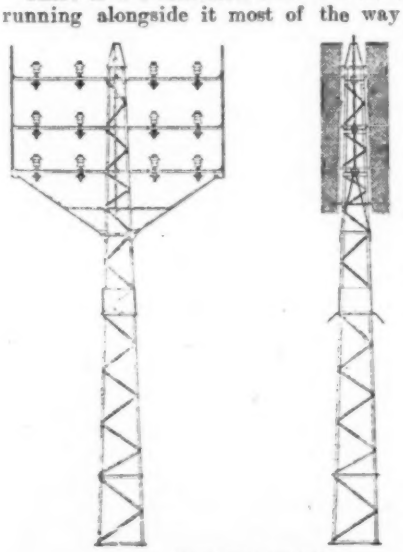


Fig. 20.—Steel Standards for 45,000-Volt Line.

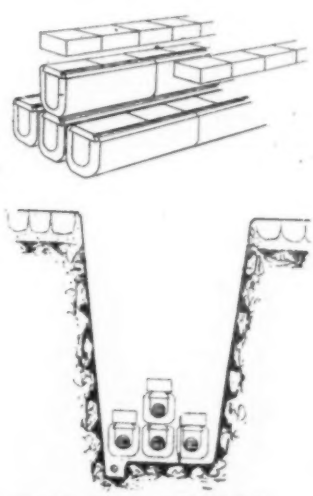


Fig. 21.—Section of 45,000-Volt Underground Mains.

Outside Roubaix-Tourcoing and Lille indoor switching stations are arranged, with incoming and outgoing feeder auto-switching gear and protective apparatus. From the former station aerial lines make connection with the Wasquehal power station. From these two stations to the three main sub-stations 45,000-volt cables are laid. To Roubaix four single-conductor cables of 340 sq. mm (0.53 sq. in.), 3.5 km. (3,828 yd.) long, to Tourcoing 2.35 km. (2,570 yd.) and 150 sq. mm. (0.23 sq. in.), and to La Madeleine-Lille 1.69 km. (1,748 yd.), also 150 sq. mm.

The single-core cables are insulated with paper and covered with lead, then surrounded by an insulating compound and two layers of tarred paper, the whole being served with impregnated jute. These cables, made by La Canalisation Electrique, of Saint-Maurice, were tested before delivery to 80,000 volts for five minutes.

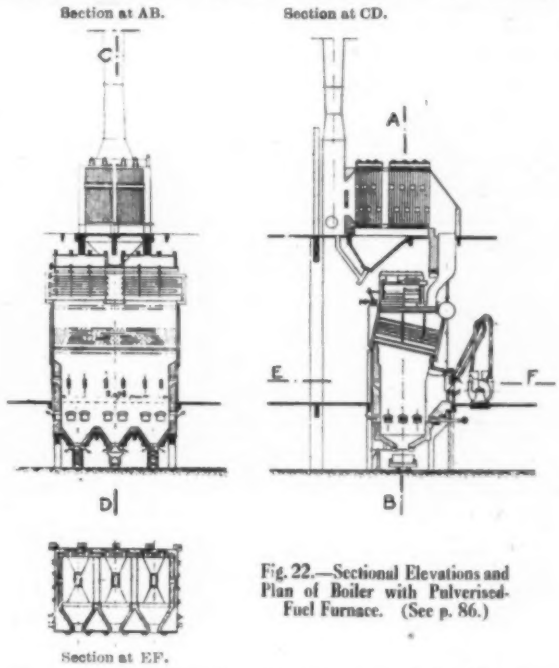


Fig. 22.—Sectional Elevations and Plan of Boiler with Pulverised-Fuel Furnace. (See p. 86.)

The four cables are laid in a trench in concrete troughing, as shown in fig. 21. The three cables at the bottom have equal spacing, and the height of the fourth reserve cable above the axis of the bottom centre one is the same as the spacing of the three below. The bottom cables are transposed into sections of one-third the length, each conductor occupying in turn the positions of right, centre, and left; the top reserve conductor runs right through. With this disposition, all the coefficients of induction of the different conductors balance out, and there is no action on the copper or lead sheath of the spare conductor. At Roubaix, Tourcoing, and La Madeleine-Lille indoor transformer sub-stations are arranged (naturally inside cities the land for outdoor sub-stations would be very expensive). The transformers are arranged in 5,000-kVA units, 45,000/10,500 volts. A cooler and a detartariser for the transformer circulating water are placed on the flat roof of each sub-station.

A small battery of accumulators is provided for the operation of the trips. In order to improve the power factor of the system, some 6,000-kVA synchronous condensers have been installed recently at suitable points.

The design, construction, and equipment of the Comines station and of the transmission lines and sub-stations were undertaken by the Société Générale d'Entreprises, of Paris, one of the largest electrical contracting concerns in France. The thanks of the writer must be given to that company, and particularly to M. Duval, their electrical engineer, and to M. Orengo, the central-stations director of the "Energie Electrique du Nord," for help in the preparation of these notes.

Hydro-Electric Power in Argentina.

Development of the Iguazu Falls.

By PERCY F. MARTIN, F.R.G.S.

UNLIKE its neighbour, Brazil, Argentina is but poorly endowed with natural waterfalls; the one source of real potential importance, the falls of the Iguazú, belongs territorially as much to its neighbour as to Argentina, forming, indeed, part of the common frontier. For at least two decades the question of joint utilisation of the falls has been mooted, and it may be stated now with some authority that use is about to be made of them by both Governments, and in connection with this an official announcement will be made at no distant date. It is proposed to build four lines, each sufficiently powerful to carry the full load, so that if any one should break down or be interrupted, there would be no complete cessation of the supply. Preliminary estimates of the expenditure place the figure at between $50,000,000 and $60,000,000 gold (£10,000,000 and £12,000,000) for supplying Buenos Aires with a *per capita* supply of 500 kWh a year, at a cost of 60 per cent. of the present rates, while the actual work of construction would occupy, perhaps, two-and-a-half years.

An Iguazú hydro-electric power scheme is by no means new. It has been visioned by successive administrations of both States, while, as far back as August, 1919, something like a definite project was put forward at the instigation of Dr. Honorio Pueyrredón, at that time Minister of Foreign Affairs, and now the Argentine Ambassador to the United States. A satisfactory feature of the proposal put forward was that when—if ever—the projected exploitation of the Falls of Iguazú came about, both Argentina and Brazil would work hand in hand to the mutual advantage of their nationals. Since then both Governments have devoted funds for the purpose of preliminary scientific investigations, and they have come to the mutual conclusion that the time is now ripe when commercial exploitation of this vast untouched water supply could be successfully carried into effect. So far as early, but necessarily incomplete, examinations of the commercial possibilities of the Iguazú Falls have proceeded, it seems that some 150,000 h.p. (subsequently to be increased to 300,000 h.p.) could be obtained, sufficient to supply the city of Buenos Aires with about 125,000 kW during ten months of the year, that is to say, about 80 per cent. of the energy produced. The remainder could be distributed *en route* to the second most important commercial town of Argentina, Rosario de Santa Fé, which would be connected up by means of a branch transmission line. The one adverse factor is the unavoidable partial service available during the dry season, when the quantity of electrical energy would have to be reduced to a maximum of 75,000 kW, thus rendering it necessary to provide an auxiliary power installation by means of coal or oil fuel which would be capable of supplementing the hydro-electric works. At the same time, it is considered possible to further increase the quantity of energy supplied by the falls of the Iguazú by the construction of a number of dams, not provided for in the engineers' original estimates.

Most of the course of the Iguazú river forms the boundary between the Rio Grande and Santa Catharina States, of Brazil, and the State of Misiónes, on the borders of Argentina, and at its mouth are located the falls of the same name as the river The only navigable part of the stream (from Puerto da Uniao to Puerto Amazonas) is in Brazil. The actual falls are 1,200 km. (approximately 750 miles) distant from the city of Buenos Aires, and the question has been raised whether it is possible to successfully transmit the energy over such a distance. Water power must, generally speaking, be developed where it is found, while fuel power can be developed where it is wanted. There must of necessity be a loss of power in transmission, while in regard to cost, not only must the plant be larger in order to deliver the required power over and above the loss, but the transmission lines must be paid for and maintained. By a prodigal expenditure, such as would have to be taken into consideration in relation to the Iguazú scheme, the losses in transmission can be made low; but this does not necessarily mean a saving in the total cost of transmission if the additional annual charges are thus unduly raised. The progress that has been made within the past few years, however, in the construction of transformers, &c., required for transmission at 220,000 V, has placed the proposal of transmitting energy over the distance referred to well within the bounds of realisation. It appears, however, from what the engineers have finally reported, that the distance to be covered between the falls and Buenos Aires cannot be shortened by any feasible means. It has been definitely decided that in drawing up the necessary calculations and conclusions, the higher voltages must be allowed for. Distance, however, beyond the heavy outlay involved by the transport of plant and material through jungly country without roads, offers no obstacle; this has been proved in numerous other similar cases, notably the transmission of energy over a length of 450 miles in Southern California, and, in another instance, where transmission has been carried over a distance of nearly 1,000 miles. It is calculated that the Iguazú Falls could be harnessed so as to provide 500,000 h.p., one half of which would go to Argentina (where, besides the city of Buenos Aires, the territory of Misiónes and the two provinces of Corrientes and Entre Rios could be brought within the scheme of supply), and the other half to Brazil.

The Falls of Iguazú consist of 275 cascades, one of which has a sheer drop of 260 ft., compared with Niagara's highest fall of 160 ft. One of the most costly items to be met in carrying out the enterprise would be the clearing of land on the Brazilian side of the falls, which are at present nothing but jungle. The vegetation is so prolific, and the rains are so heavy and abundant, that special thoroughfares would have to be made, and, when constructed, kept in order at a very heavy outlay. The question of labour would be less difficult to solve, since there is an almost unlimited number of native hands available both on the Argentine and the Brazilian sides.

The Iguazú is not the only potential source of electric energy in Argentina. Investigations have shown that the waters of the Salto Grande, north of Concordia (Argentina), and the Salto (Uruguay) could be utilised, so that the neighbouring states could obtain from the falls a supply of not less than 50,000 h.p. In the Department of San Rafael the Atuel falls could be utilised to provide sufficient energy to electrify the system belonging to the Western Railway. In Argentina, where, as indicated, no waterfalls are available, and wood, coal (imported and native), and petroleum are extremely costly, the only solution of cheap fuel provision is for factories to group themselves about central stations of large capacity, and take their supplies from them. These installations, furnishing many thousands of kW, could supply at rates far below the cost of electricity produced upon a small scale by means of isolated plants. Indeed, in Argentina the rates are not high if considered from a comparative point of view, and for a country which has earned the reputation of being one of the most expensive in the world in which to live. The fact becomes the more notable when it is remembered that practically everything having relation to electricity has to be imported.

Initiating Mr. Smithers.

By "STAN DARD."

I WAS considering packing up for the day when the bell summoned me to the Chief's office. As I wended my way there I cast about in my mind for any technical omissions I might have made recently, for, as a rule, a summons to the Chief's office meant but one thing: that there was "something up." I had satisfactorily gone through two recent jobs by the time I had reached his sanctum, and as I opened the door I began to marshal the facts relating to one not quite so favourable. My trend of thought was upset by the unusual aspect of my Chief.

He was seated, as might have been expected—true; but his customary highly-critical demeanour seemed to be lacking. His gaze, usually of an e.h.p. quality and directed point-blank at the arriving victim, was unexpectedly mild (even irresolute), and it was lingering upon someone else. The latter was a young fellow, who (remarkably enough) appeared perfectly at ease. Indeed, a chance onlooker would at once have identified him as the most impressive character in the room.

"Oh—er, Dard," said the Chief, turning towards me. "This is Mr. Smithers, who is joining us for an insight into our—er—work. I'd like you to take him along with you to-morrow and initiate him. You might as well be getting on with these four jobs."

On the following morning I had some difficulty in locating the latest arrival, and eventually found him, in a state of abstraction, behind "The Wireless Herald." He appeared somewhat taken aback and (to my relief) not quite so impressive as on our first meeting.

"We'd better be getting along," I hinted. "By the way," I went on, "I wouldn't advise you to wear such good togs on our work. The jobs to-day, for instance, are a bit rough-and-ready, so to speak."

"Oh, that's all right," he hastened to assure me. "I know what electrical work is like."

During our run to the first place I gathered that Smithers, after leaving college with a technical degree, had found some difficulty in adapting himself to the practical world. Yes, electrical work appealed to him. He seemed, though, to be under the illusion that electrical conditions were just a kind of magnified lab. work. Our first halting-place was in the nature of a rude awakening. It was a flock factory. Here a number of carts were unloading sackfuls of rags, which were first placed in ovens. Inside the factory proper were a number of machines looking very much like a.c. generators, the rotors, however, bearing nasty-looking spikes; into these machines the rags were fed, to emerge from the tearing process as flock. They were driven by electric motors, and, as I explained to Smithers, our job was to investigate the electrical conditions following on the installation of some static condensers.

Smithers, however, was in no mood for technical matters, and as time went on his interest decreased to zero. This was understandable, and due to a detail which I have neglected to mention. The atmosphere of the factory was stiflingly hot, and full of tiny, irritating fragments of flock. These had filled all the crevices in the walls, and every article in the place bore deep layers of flock—the Supply Co.'s meters and cables being especially favoured. Smithers' discomfort impelled him to retire from the scene, coughing and itching. Having arrived at my power-factor and other details I, too, hastened to leave. Smithers was conversing with the foreman. "Been long here?" said the latter, with a hearty and fluffy laugh. "Lor' bless yer, fourteen years!"

For some miles Smithers was silent but still *restless*. At last he enquired as to our destination. I told him: a soap and candle works. I added that there was no reason to expect an atmosphere like the flock factory's. This was not altogether fair, because the atmosphere we presently entered more than made up in aroma for what it lacked in solid matter. Our technical work here dealt with the metering; the works was on a day-and-night tariff, and as the day meter had gone on strike and the night meter was working a 24-hour shift, the works was receiving all energy at the cheaper rate. When the fault was cleared and we reached the fresh air, Smithers expressed the view that it was a wonder *anything* worked in such a place. "Besides," he added, with some indignation, "what do people want with candles nowadays? Soap I suppose we need, but candles . . . !"

When he heard that the next job was down a pit he cheered up surprisingly. I hinted that we'd have some work to do—as a matter of fact we got more than I bargained for. At the pithead we met the electrician and had a long and cold wait while a "set" of tubs was hauled to bank. I donned overalls and cap, while Smithers elected to retain his top coat in lieu of dungarees. At last the banksman nodded us into the cage.

The cage dropped and Smithers gasped. The shaft was a wet one, and water splashed into the streaming cage. Smithers's top coat was not so out of place after all! At the bottom we paused awhile to attune ourselves, the onsetter regarding Smithers's trilby and top coat with frank amazement; then, burdened with current transformers, instruments and lamps we set off inbye—the electrician leading the way. For a while we clambered and splashed over tramlines in a main road. The roof lowered, and abruptly we turned right, down a steep incline. Bent nearly double, and half-slithering, half-walking, I managed to keep in sight of the electrician. Behind me I could hear Smithers stumbling along. I was perspiring freely and did not envy him.

The electrician halted. We had reached our objective—a wet and dimly-lighted pumphouse. Here was a pump driven by a 60-h.p. electric motor, the working conditions of which were to be investigated. Smithers was exhausted and sad, and, I am afraid, was not of much help. I do not think he was able to reconcile his expectations to the crude actuality. The investigation was duly completed, in spite of water and bad light and Smithers's wilting state. After a hard climb back to the shaft-bottom, and another wet journey to bank, we were once more on the surface, and on our way to the last job.

Smithers seemed to be thinking hard, and at last affirmed that he would never again criticise miners. After another spell of thought he went on to say (frankly if ingenuously) that electrical engineering (or to-day's sample of it) was not what he had expected. When I gently made the inevitable rejoinder he hesitated, and his answer, beginning with a floundering attack upon his technical education, ended by a confession of his espousal of wireless. (No wonder he had, earlier in the day, been so contemptuous of our local frequency of a mere 50 cycles!) He was commencing a description of his latest "super-het" when the increasing flavour of the air informed me that our last destination (a glue factory) was nigh.

Smithers was visibly reluctant at entering, but during a breather in the office he must have pulled himself together, for when I appeared with the engineer he followed us with no apparent hesitation. The technical trouble here lay in the fact that the normal maximum demand had suddenly risen. The engineer's ideas anent his hourly max. demand were hazy—as often is the case. Having examined the demand indicator and found it in order, by some judicious inquiries we elicited the real cause: their gelatine section, long disused, was starting up again.

Our wanderings took us through an atmosphere hot

and stinking. At one place we passed a mysterious tank around which a dense crowd of big flies were busy. Hides, skins, and bones were being melted in open boilers, and the glue-stock boiled in water. In wooden congealing boxes the gelatinous fluid formed into stiff jelly, after which it was cut up and dried. All these interesting operations were marred by the stench. As Smithers (looking sick) and I hastened to depart, the engineer, with an air of pride, showed us a sample sheet of glue, and explained how the beautiful polish was obtained by re-dipping in water and again drying. "A fine bit of stuff," he said, passing his hand lovingly across it. "If ever you want a good piece of glue, just you come along here."

On our homeward journey Smithers contented himself with a large number of abnormally deep breaths, and his "good night" was uttered in rather dejected tones. I forebore to press for an opinion of his day's experiences. I saw him next morning engaged in a confab. with the Chief, and from that day "our place" knew him no more. The Chief announced briefly that Young Smithers was not continuing with us.

Whom should I meet a week later but Smithers himself! He appeared supremely satisfied with existence. His greeting, whilst a trifle lordly, was tinged (I verily believe) with a certain respect—perhaps he admired my courage in professionally penetrating into noxious regions. He was now, it appeared, with a radio engineer and "doing well." I congratulated him on dropping into a more congenial sphere and, as we parted, I told him that there was one thing he need never want. He looked puzzled. Then I reminded him of the kind offer of the glue factory engineer: "If ever you want a good piece of glue, just you come along here." At that Smithers's face paled, a shudder passed over him, and he hurried away.

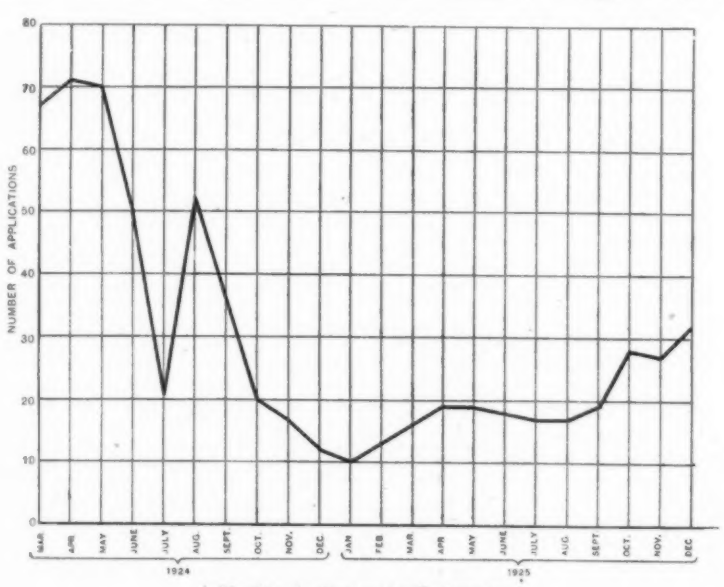
The Registration of Electrical Contractors.

The Present Position and Progress of the National Register.

By P. V. HUNTER, C.B.E., M.I.E.E., Chairman of the Executive of the N.R.E.I.C.

IT may be opportune at the commencement of a new year to review the progress which has been made since the National Register of Electrical Installation Contractors commenced to receive applications in March, 1924, and to consider to what extent the ideals of those who originally laboured to establish it are being met.

Considering first of all the purely statistical side of the subject, it is interesting to find that a total of 930 installation contractors had applied for admittance to the Register up to December 31st, 1925. Of this total, 804 had been registered on that date, and 50 were still under consideration. The remainder (76) for various reasons were declined. The rate at which applications have been received, while showing occasional variations, has on the whole been gratifyingly regular. For the benefit of those who prefer to absorb such information in graphical rather than purely arithmetical, form the graph appearing herewith, showing the monthly rate at which applications have been received during the time the Register has been in operation, will be of interest. It is evident from this that there is no sign at present of a decided falling off in the rate of application.



Monthly Applications for Registration.

It is difficult to form even an approximate estimate of the proportion which the number of contractors admitted to the Register bears to the number of those who are eligible. The total number of installation contractors within the area embraced by the Register is not known, and estimates as widely different as 2,000 and 7,000 have been made. The smaller figure probably more nearly represents the number eligible for registration, as the larger one admittedly includes all those working electricians who occasionally purchase wiring material but have no established business or equipment. It is evident, however, that there are still many suitable contractors who have not been registered. The causes operating to prevent these eligible contractors from applying for registration are somewhat difficult to determine. It is no doubt a fact that some of the smaller contractors quite misunderstand the policy of the Register with regard to admittance. They are under the impression that the standard is set largely by the magnitude of the contractor's operations, whereas in point of fact quality of work and reputation are the real essentials, and provided that the minimum accommodation and equipment necessary to carry on as a contractor are in the possession of the applicant, the magnitude of his business is not such an important consideration. To some extent no doubt this erroneous impression has been fostered by the support given to the Register by the larger and better established firms. Practically the whole of the contractors of this class were admitted to the Register in its early days; they had little or nothing to gain in reputation by being registered, their principal object in applying being to help forward the cause of registration *per se*. It is to be hoped, therefore, that their action will not have the opposite effect to that intended, namely, of deterring eligible contractors from applying for admittance to the Register.

Another source of misunderstanding arises from the fact that many people have an erroneous impression of the object for which the Register exists. Those who have not given the matter more than casual consideration are apt to assume that the Register is a purely trade organisation existing for the benefit of those who are registered. This idea cannot be too forcibly contradicted. The primary objects of the Register are to

serve the public who employ wiring contractors by providing a list of names of contractors who can be relied on, and to raise and uphold the standard of good workmanship. For this reason wiring contractors are in a small minority on the Registration Board, the major portion of the *personnel* being nominated by various institutions representative of different sections of, and who are interested in the advancement of the electrical industry, so that both the public and the applicant for registration may be assured that the Register will deal impartially with applications, and that so far as can be foreseen none but competent contractors will be registered.

Registered contractors are of course entitled to the advantages which accrue to them from being registered, but that is not one of the immediate objects for which the Register was formed, though it is necessarily incidental, and the National Register is not therefore conducted as if it were. On the other hand, every endeavour is made by the Registration Board to ensure that the eligibility of a contractor for registration is, subject to compliance with certain requirements under the rules, judged purely on his merits as an installation contractor. In particular, too, academical consideration of the candidate's qualifications is avoided.

For this purpose the Executive Committee has the advantage of the co-operation of some 100 local advisory committees who can be relied on to report on the candidate's qualifications from personal local knowledge in a manner which could never be approached by a committee at headquarters. More are in course of formation, and additional ones will be formed where required. These local advisory committees each consist of three members, one representing the Institution of Electrical Engineers, another the electricity supply section of the industry, and the third member is a Registered Contractor. The assistance of these advisory committees has been of the greatest value to the Executive Committee of the Board, and has undoubtedly operated to the advantage of *bonâ fide* installation contractors.

At the present time the need for a National Register of Installation Contractors is more pressing than has been the case at any time during the history of the electrical industry. The last two years has seen an enormous expansion in the numbers of domestic installations wired for electricity supply. It is quite common experience for the number of installations connected annually to be four times that of a year or two ago, and the rate is still increasing.

In such circumstances it is obviously difficult for trained *personnel* to keep pace with the growth of demand. In particular, this rapid expansion has brought into prominence the jerry wireman who, without any business establishment or resources, undertakes domestic installations purely speculatively. Generally in order to get the business, the prices quoted have to be so low as not to permit of proper workmanship or material being employed. The National Register takes the greatest trouble to distinguish between such undesirable speculators and the genuine installation contractor who, although in a small way of business, is doing good honest work, and the latter class may submit their names to the Register with every confidence that they will receive proper consideration.

Householders who employ wiring contractors necessarily do so at such very infrequent intervals that they are seldom in a position to judge of the merits of any contractor they employ from personal experience, in the same way that they are able to judge other tradesmen with whom they are constantly dealing. The existence of the Register should therefore be of the greatest assistance to them. Many public bodies are so satisfied of its advantages that they have signified their intention of confining installation contracts to registered contractors, in order to ensure that a reliable job will result.

It is naturally the case with an organisation that has only been set up for such a short time, that the full effect of the existence of the Register has not yet been felt. The action and reaction between the purchasing public who find it advantageous to employ only registered contractors, and the increasing number of contractors who find it advantageous to register because of this employment, have obviously not had any marked effect in the short time during which the Register has been in existence, but they may be relied on eventually to ensure that the majority of contractors who are eligible will find it advantageous to register.

Legal.

Consolidated Electrical Co., Ltd., v. London Woollen Co., Ltd.

IN the Court of Appeal on January 18th, Lords Justices Bankes, Scrutton and Atkin heard an application by the plaintiffs in this matter for an order requiring the defendants to give security, to the extent of £200, for the costs of an appeal which they had entered from a judgment of Mr. Justice Avory and a special jury in the King's Bench Division on November 12th last (*vide* ELEC. REV., November 20th, p. 840).

For the plaintiffs it was contended that the hearing of the appeal would take some time. The defendants replied that there was only one point in question, and they had offered security of £50.

The Court ordered the defendants to give security in the sum of £75.

Heath Pritchard, Ltd., v. Schnider.

IN the Bow County Court, on January 15th, before Judge Snagge, Messrs. Heath Pritchard, Ltd., electrical and general engineers, Canning Town, E., sued Mr. Schnider, a tailor and outfitter, of Victoria Dock Road, E., to recover £5 2s. 6d. for electrical work done at the defendant's shop.

The plaintiffs' representative said that it was agreed to carry out the work for £3 5s., but when the Council's official inspected the work, he found fault with the connections, which had nothing whatever to do with them, and alterations had to be carried out, which ran up the cost. The defendant suggested that these alterations had nothing to do with him, but the plaintiffs' representative said that they were bound by the Council, and the consumer had to pay.

Judge Snagge gave judgment for the plaintiff for £5 2s. 6d. and costs.

Attorney-General (St. Pancras Corporation) v. County of London E.S. Co., Ltd.

THE Corporation of St. Pancras, through the Attorney-General, brought an action in the Chancery Division on January 13th, claiming an injunction restraining the County of London Electric Supply Co., Ltd., from supplying electrical energy outside its area, and within the area of the Corporation, *viz.*, to the property belonging to E. Hulton & Co., Ltd., Gray's Inn Road, W.C.

SIR T. H. HUGHES, K.C., for the plaintiffs, said the object of the action was to restrain the defendant company from acting *ultra vires* by supplying electrical energy outside its area of supply. The plaintiffs were the electricity authority for the borough of St. Pancras, and the defendant company had an area in the borough of Holborn. Hulton's had acquired a large piece of property bordered by Gray's Inn Road, Wilson Street, Gough Street, and Elm Street, and had erected large works for which they required a very large supply of electricity. About 1,000 square yards of Hulton's premises were in the defendant company's area and the remaining 5,000 in the Corporation's area. Hulton's approached the Corporation when their buildings were being put up with regard to a supply of electricity, and after long negotiations they signed an application form in January, 1923. But in the following month they got into communication with the defendant company and negotiated for a competitive supply, and on June 13th, 1923, a contract was entered into with the defendant company. But anticipating that there might be trouble they took an indemnity from the defendant company against any action that might be taken by the St. Pancras Corporation. The whole of Hulton's site was in the borough of St. Pancras, but, as stated, the whole of it was not in the Corporation's area of supply. Hulton's contract with the defendant company provided for a minimum payment of £4,500 a year for electricity for a minimum period of seven years.

Having referred to the various Acts and Orders bearing on the case, Counsel said that the defendant company was supplying energy for the whole of Hulton's premises as constructed and intended to supply it to those premises yet to be built in contravention of the provisions of the Acts and Orders quoted.

His LORDSHIP (Mr. Justice Tomlin) said he understood the question to be whether under these Acts and Orders the supply of energy meant supply to the terminals of the consumers in the manner suggested in the decided cases. If that was so it would seem to be a question of fact as to where the energy was supplied. If it was supplied to terminals within the defendant company's area the next question was whether the consumer was with the knowledge of the defendant company using it for purposes outside the area.

SIR THOMAS HUGHES agreed that these were questions to be dealt with, but he submitted that the supply was being made to the lamp that was burning or to the engine, and not, as in

this case, to the defendant company's sub-station on Hulton's premises in Elm Street.

Evidence was called on both sides, and SIR ARTHUR CLAUSON, K.C., submitted the case for the defence. It was denied that the defendant company was supplying energy beyond its statutory area in contravention of the material Acts and Orders. If Hulton's intended to use energy supplied by the company for one part of their property on another part, the defendants denied that this would constitute a breach of the Acts or Orders. They further denied that the St. Pancras Corporation had been ready and willing to supply energy to Hulton's on reasonable terms. Alternatively it was submitted that if the defendants had committed any breach (which was denied), the Corporation was not entitled to the relief it claimed. Under Section 6 of the County of London (Northern Extension) Electric Lighting Order, 1897, as confirmed by the Electric Light Orders Confirmation Act, 1897, it was indicated that should the defendants supply energy in contravention of Section 5 of the Order, which delimited the defendants' area, the Electricity Commissioners had power to revoke the Order. They contended, therefore, that the Corporation's remedy was by application to the Commissioners, and that that Court had no jurisdiction to grant the relief claimed.

The hearing was adjourned.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

A Swedish Company's Activities.—The Allmänna Svenska Elektriska Aktiebolaget has obtained large orders for electric power stations in New South Wales. The works are at present well occupied with orders from Sweden, Finland and Russia. The negotiations with the Soviet authorities for a concession for the resumption of the company's engineering activity at Jarcslav are expected to terminate within a few days.—*Reuter's Trade Service* (Stockholm).

A Large Stoker Order.—The Riley Stoker Co., Ltd., has received an order for eight Riley "Super" stokers, each to burn up to 10 tons of coal hourly, for eight Babcock boilers, each for 134,000 lb. actual steam hourly, and for 156,000 lb. overload. Four boilers will have water-cooled walls; the other four will have the ordinary straight-wall settings. Each stoker has an undivided furnace, the incandescent surface of the entire fuel bed radiating direct to the boiler tubes which form the roof boundary of the archless furnace. This is a repeat order from a central station already using 13 Riley stokers.

The F.B.I. and Inter-Imperial Trade.—The Federation of British Industries has addressed to the Prime Minister a letter dealing with the importance of the Empire markets as consumers of British manufactured goods, and urging the necessity for encouraging this trade in every possible way. It is pointed out that in 1924 the value of United Kingdom exports to various parts of the Empire were valued at £337,000,000, and represented 41 per cent. of the total export trade of this country. The need for an increase in our total export trade is evident, and is the true solution of our unemployment problem. The expansion of our exports to the Empire depends upon the purchasing power of the Dominions, and the greater the volume of Dominion products bought by us the greater is the possibility of the purchase by the Dominions of British manufactured goods. The letter concludes by expressing the opinion that the reports issued last year by the Imperial Economic Committee deal with some of the most pressing problems confronting the Empire to-day, and the Prime Minister is asked whether the Government intends to issue a statement with regard to the action which it is proposed to take on these reports.

Paraguayan Electrical Imports.—A report upon Paraguay by Mr. F. W. Paris, British Chargé d'Affaires at Asuncion (Stationery Office, 1s. net), includes some details of the country's electrical imports. The total value of these in 1924 was £18,185, as compared with £9,968 in 1923. During the first half of 1925 the value rose to £16,292. The United Kingdom's share in 1924 was valued at £1,665 (£325 in 1923), but there was a fall to £400 during the first half of last year. On the contrary, Argentina's share rose from £1,720 in 1923 and £4,528 in 1924 to £10,075 in the first six months of 1925. The figures for Germany were:—1923, £1,947; 1924, £1,123; and 1925 (six months), £2,603. The equivalent figures for the United States were £460, £1,543, and £4,242.

The British Industries Fair.—Preparations for the forthcoming British Industries Fair, to be held in London and Birmingham from February 15th to 26th, are now well advanced. Nearly 250,000 square feet of space has been booked, a large number of overseas buyers have already intimated their intention of visiting the Fair, and there is little doubt that it will be one of the most successful of the series. To celebrate the opening of the Fair, a banquet will be given by the Government on the opening day. The Prince of Wales will be the principal guest, the Lord Mayor of London is lending the Mansion House for the occasion, and Sir P. Cunliffe-Lister, M.P., President of the Board of Trade, has promised to preside. The annual banquet of the Birmingham Chamber of Commerce has been fixed to take place during the first week of the Fair. Advantage is being taken of the presence in the City of a large number of prominent overseas and home buyers, and many of these will be invited to the function.

Irish Free State Electrical Imports.—The official returns show that the imports of electrical goods into the Irish Free State during October last attained a value of £58,983, as compared with £38,495 in the corresponding month of 1924. The aggregate imports for the first ten months of the past year are returned at £308,015, as against £329,269 in the similar period of 1924. It should be noted that the foregoing figures do not include electrical machinery.

The Eight-hour Day in Sweden.—The Government proposes that the present law relating to the eight-hour day, which is to remain in force until the end of 1926, shall be rendered definitely valid after that date with certain changes in order to bring the law into conformity with the Washington convention and prevent the abuse of concessions granted by the present law.—*Reuter's Trade Service* (Stockholm).

Glass-makers and Protection.—Representatives of employers and workmen concerned in the glass industry met in national conference at Birmingham on January 13th to consider the question of initiating a new movement for securing recognition of the claims of the industry to protection against foreign competition. The bodies represented were the British Flint Glass Manufacturers' Association, the Northern Association of Pressed Glass Manufacturers, the National Flint Glass Makers' Society, and the Pressed Glass Makers' Society. Mr. William Stuart, of Stourbridge, presided. The view was expressed that the application previously made could only have been rejected through inappreciation of the situation of the industry, and its importance from a national standpoint was shown during the war. It was recalled that the Controller of Glassware made a record that the production of chemical, medical, surgical, and other scientific glass-ware, bulbs and tubing for electric lamps, and glasses for miners' lamps, assisted very materially in the successful prosecution of the war. A resolution was passed in favour of steps being taken to promote a further application to the Government.

Lead.—In their report for January 16th, Messrs. James Forster & Co. say:—"The Board of Trade returns, as below, give the December imports as 30,132 tons, which constitutes a record for arrivals during any one month, and up to the 13th of this month about 15,000 tons have been imported. In addition to all this lead, it is estimated that there are probably 5,000 tons in warehouse. In face of the foregoing, and with the present consumptive demand, the price of £35 per ton for lead seems to us to be quite high enough. The Board of Trade returns for December were:—Imports, 30,132 tons; exports, 3,174 tons; leaving for home consumption, 26,958 tons."

The A.E.U. and the Industrial Alliance.—Ballot papers have been issued to its members by the Amalgamated Engineering Union asking them to vote for or against the proposal to affiliate with the Industrial Alliance. The Alliance at present embodies the miners', railwaymen's, transport workers', iron and steel workers' and other trade unions, which have undertaken to afford one another financial or active support in industrial disputes.

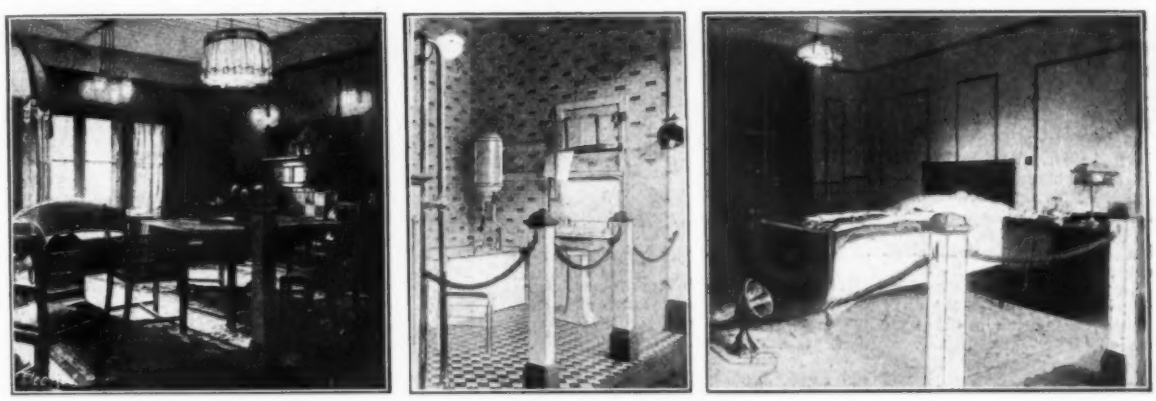
Exports of British Machinery.—Commenting on the Board of Trade Returns issued last week, the British Engineers' Association points out that some of the most satisfactory figures are those relating to the exports of machinery, motor cars, locomotives and electrical apparatus. The total of exports of machinery for December, 47,744 tons, is not only the highest monthly total recorded this year, it is higher than that of any month during the past three years. The total exports of machinery for the year 1925 amount to 515,896 tons, the highest figure for any year since 1913. The steady tendency to improvement recently reported by the Association is generally confirmed by these statistics. It should not be forgotten, however, that the total export tonnage of machinery still represents only 75 per cent. of the pre-war average, and that there is still considerable leeway to be made up, but given favourable conditions, and no acute labour disturbances, it may reasonably be anticipated that the results for the ensuing year will show further and progressive improvement.

Venezuelan Contract for a British Company.—It is announced that MESSRS. MELDRUMS, LTD., have been awarded a contract for a complete refuse destructor installation for the city of Caracas. The plant will have a capacity for dealing with 100 tons of refuse per day and will provide steam for the generation of electrical energy.

Belgian Cable Orders for Germany.—The *Financial Times* reports that the orders for large quantities of telephone cable recently given by the Belgian Government have been placed partly with the Felten and Guilleaume Company and to a large extent with the Allgemeine Elektricitäts Gesellschaft, of Berlin.

Another Western Electric Development.—It is reported that the wholesale electrical supplies business carried on by the Western Electric Co., Inc., has been separated from that company's telephone manufacturing business, and put in charge of a new company known as the "Graybar Electric Company." Our contemporary *Electrical Merchandising* says that this gives a separate identity to the "largest wholesale distributor of electrical apparatus and related equipment in the world." The business was first conducted by a partnership under the names of "Gray & Barton," from which the new name has been derived. The president of the new company is Mr. A. L. Salt, and the chairman of the board of directors is Mr. C. G. Dubois. The capitalisation is $15,000,000, all owned by the Western Electric Co. The company will market a wide variety of appliances which have hitherto been sold under the name of "Western Electric," under the trade name of "Graybar." The range will include generators and motors, cables, telephones, lamps, domestic appliances, and radio apparatus.

Electrical Display at Birmingham.—In connection with the recent Birmingham and Midland Institute conversazione, the Birmingham Electric Supply Committee arranged an "All-electric home" at the Institute. The exhibit comprised a combined lounge and dining room, a part of which is depicted in the left-hand section of the accompanying illustration; a bathroom (centre); a bedroom (right); and a kitchen. The display proved most attractive and interesting, and elicited much favourable comment. In the combined lounge and dining room, the prevailing style of furniture and decorations was that of the Tudor period. It contained a 3-kW "Magicoal" fire, supplemented by a 2-kW portable fire. There were two lighting brackets with 40-W white gasfilled lamps, and a four lamp lantern fitting for the general lighting. A counterweight fitting with three 40-W white gasfilled lamps was fixed over the dining table, and a floor standard and desk lamp were also shown. There was an up-to-date array of small appliances consisting of coffee percolator, table grill, toaster, kettle, hotplate, iron, vacuum cleaner and fan, also the ubiquitous loud speaker. The bedroom was furnished in mahogany. A two-light rise-and-fall pendant was fixed over the dressing table, a single counterweight light in the centre of the room, and over the cot a single "Osglim" lamp. A tray as set for early morning breakfast, with kettle, toaster and reading lamp, was placed on a table at the side of the bed. The heating was by means of a 2-kW "Arora" fire, with a 600-W bowl fire for occasional use. In the bathroom a geyser was fitted over the lavatory basin, and a 3½-gal. electric geyser for the bath. It also contained a 2-kW cabin fire fixed to the wall, electric towel and gown rails, and a shaving mirror with a spot light. A totally-enclosed bowl fitting was installed for lighting. In the kitchen the apparatus consisted of an "All-British" washing machine, an automatically regulated refrigerator with compartments for freezing and cooling, one of the latest pattern 6-kW type cookers as supplied on hire by the Birmingham Electric Supply Department, and a 2-kW fire for general warming purposes. A totally enclosed ceiling lighting unit, with special adaptor for use with occasional appliances, irons, kettles, &c., was fixed in the centre of the room.



An "All-Electric Home" at Birmingham.

The "Americanisation" of Canada.—The penetration of American goods and ideas into Canada has been increasing at a rapid rate during the past few years. According to the Toronto *Electrical News*, this is not viewed without alarm in certain circles. Recently at an annual meeting of chambers of trade and commerce in Ontario, a resolution was passed urging the Dominion Government to place an import duty on American magazines entering Canada (of which there are said to be 150), as these consist largely of advertising matter. The latter, when it enters undisguised, is subject to a duty of 15 cents per pound.

Swedish Telephone and Telegraph Exports.—According to the *Swedish Economic Review* (the journal of the Swedish Board of Trade) the exports of telephone and telegraph apparatus during the period January—November, 1925, were valued at 6,476,000 kr., as compared with 6,778,000 kr. in the equivalent period of 1924.

Chinese Notes.—The Honan authorities have recently ordered five small radio plants from the Siemens (China) Co.

The whole of the property of the Kiangwan Electric Co. (Shanghai) has been acquired by the Chapei Electricity and Waterworks Co.

Lead Prices.—We have received from Messrs. M. H. Cawson & Co. a chart showing the prices of soft foreign pig lead for each month from 1913 to 1925 inclusive. Statistics of imports and consumption for each year are also given.

The Timber Trade.—Our Timber Trade correspondent reports that the demand for soft woods for general requirements is increasing in volume, which is assisting the rather large stocks on the London and provincial markets. Prices of late months have been on a very cheap level, considering costs of production, and the year 1925 has been an unremunerative one to the trade, and especially to the foreign exporters. The latter, however, are now attempting to raise values for shipments to come forward this season, and although these values will be on a slightly higher level, compared with 1925 closing rates, they will be lower than prices ruling a year ago. In the hardwood section of the trade, prices for all descriptions are firm, and this is especially so of teak, which is used in the electrical trades for various purposes. Mahogany is also a firm market, and those choice timbers described as "fancy woods" continue to be strong in value.

A Visit to Germany.—The *Birmingham Post* reports an address by Mr. Wilfrid Hill to the members of the Council of the Birmingham Chamber of Commerce upon the economic position of Germany. Mr. Hill, who has paid a series of visits to that country, said that Germany's national wealth had shrunk, and that had caused a scarcity of money which was holding up trade. The payment of reparations was being made by means of money borrowed at high interest, and Germany could only repay this by exporting goods. Export trading was rendered difficult by the tariff walls which had been raised against German goods. This was a problem which affected not only Germany, but, more or less, every other European country, and might possibly result in a European Zollverein, a project which was under consideration at the present time. It was not true that German competition was more aggressive than before the war in all branches. The plant, machinery, skill and determination were there, but the motive power of adequate money was lacking. At the recent Berlin motor, motor-cycle and cycle show it was admitted that German productions were badly beaten, both in price and quality, by British products, and that was the case in many trades. German banks were charging from 10 to 14 per cent. for accommodation. Wages, however, had not increased to the same extent as British wages, but the demand for increases was persistent. Taxation was at nearly three times the pre-war level, representing 46 per cent. of the German people's income, as compared with 18.6 per cent. in our own case. Other handicaps were the eight-hour day, and higher freight charges. Mr. Hill said that for the next two years he failed to see Germany as an effective competitor in the world's markets, and "it was now the psychological moment for those who had complained so bitterly of German competition in the past to thoroughly realise the situation, and so take steps not only to regain that which was lost, but even to sell goods in the German home market, which in many trades was actually possible to-day."

Foreign Glassware.—At a meeting of the Weymouth Town Council, last week, a protest was offered against the acceptance of the tender of a foreign firm for globes for the public electric lamps. The borough electrical engineer said that no British firm could make the globes. Another speaker said that the globes were made in Czecho-Slovakia. The tender was accepted.

Industrial Court President Resigning.—It is reported that Sir William Mackenzie, K.B.E., K.C., is shortly resigning the post of President of the Industrial Court, which he has held since the establishment of the Court in 1919. The Minister of Labour has appointed Mr. Harold Spencer Morris, K.C., to succeed him as President. Mr. Morris was appointed last year to be Chairman of the Railway Wages Board in succession to Sir William Mackenzie.

Unemployment.—No unemployment figures were issued for the week ended December 28th, but during the subsequent week the number of unemployed registered was 1,251,900, an increase of 149,500 during the fortnight. There was, however, a decrease of 30,306 in the subsequent week.

A Unique "Dividend."—*Electrical Merchandising* reports that the Hartford Electric Light Co. stated in a recent note to its consumers that as its working expenses had been abnormally low, and the earnings were about 5 per cent. more than required for interest, dividends, and a moderate surplus for the year, each customer would receive a "dividend" in the form of a 50 per cent. discount on his October bill.

Trade Announcements.—MR. FREDK. J. GORDON, formerly a sales director with Fuller's United Electric Works, Ltd., is now established as a manufacturers' representative at 91, Moorgate Street, London, E.C.2. He has just taken over the London agency for the Clayton Rubber Co., Ltd., of Manchester, and is open to take up another in addition.

MESSRS. SPRECHER & SCHUH CO., Aarau, Switzerland, announce that, in order to meet the increasing demand for their switchgear, "and to comply with the justifiable desire of customers that it should be of British manufacture," they have made arrangements with Messrs. Isenthal & Co., Ltd., to manufacture it on their behalf and to their designs at their Denzil Works, Willesden, N.W.10. Communications should be addressed to Mr. J. B. Rudkin, the company's representative, at the London office, Albion House, 59, New Oxford Street, W.C.1.

MESSRS. G. F. CLARK & PARTNERS, consulting engineers, of Parliament Mansions, S.W., have removed to 7, Victoria Street, S.W.1.

Catalogues and Lists.—THE IGRANIC ELECTRIC CO., LTD., Elstow Road, Bedford.—A number of publications dealing with "Igranic" and "Igranic-Pacent" radio apparatus, as condensers, filament resistances, transformers, &c., and complete supersonic heterodyne receiving outfits.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester.—Leaflet 4045, describing methods and apparatus for testing portable accumulator batteries.

MESSRS. CHARLESWORTH, PEEBLES & CO., 5, Eden Street, Hampstead Road, N.W.1.—A leaflet and price list advertising the "Quickfix" electric light gallery.

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, Oxford Street, W.1.—A folder illustrating the illumination of a number of cathedrals and churches; and a pamphlet giving illustrations and prices of "Luxor" lighting fittings.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—A mailing card advertising "G.E.C." Home Office fuse boards.

SWITCHGEAR & COWANS, LTD., Elsinore Road, Old Trafford, Manchester.—A set of scales from ½ in. to 3 in. = 1 ft. Much useful information is given on the scale backs including conversion tables, and British standard tables for bare copper conductors and wire gauges.

SMITH & ANSELL, LTD., Stockfield Road, Acocks Green, Birmingham.—Illustrated pamphlet describing a new series of lighting fittings known as "Cylinder Units."

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—January price sheet of electrical materials, appliances and accessories.

MESSRS. DONOVAN & CO., 47, Cornwall Street, Birmingham.—An illustrated booklet dealing with industrial panels made by combining "Safuse" and "Donlok" switch and fuse gear with busbar chambers.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—January stock list of motors and dynamos.

MESSRS. J. MCMILLAN & CO., 17, Surrey Street, Strand, W.C.2.—A price list of telephone condensers of from .005 to 4 mfd. capacity.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, U.S.A.—Illustrated pamphlets dealing with induction frequency changers, self-propelled 'buses, and the "Inertaire" transformer.

MESSRS. FERRANTI, LTD., Hollinwood, Lancashire.—Pamphlet Ta.746, illustrating and describing the "Ferranti" surge absorber.

ORION LAMPS, LTD., 15, Eldon Street, London, E.C.2.—Price list of "Orion" gas-filled and vacuum lamps.

MESSRS. COLEY & SWINNERTON, LTD., St. John's Square, Wolverhampton.—Three illustrated and priced pamphlets, dealing respectively with the "Electric Perfection" oven, the "Savex" cooker, and the "Savex" wash boiler.

MESSRS. E. P. ALLAM & CO., 107-109, Gray's Inn Road, W.C.1.—Monthly stock list of d.c. motors, &c., for sale or hire.

Bankruptcy Proceedings.—H. L. WOOD, 7, Taswell Road, Southsea, Hants., electrical engineer and wireless dealer.—The first meeting of creditors was held on January 18th at the Official Receiver's offices, Portsmouth. The statement of affairs showed liabilities of £4,069, while the net assets were estimated at £85, leaving a deficiency of £3,984. Debtor attributed his failure to liability under judgment given against him in an action brought by his late partner. It appeared that in December, 1918, with about £500 capital, he commenced business at High Street, Clapham, as an electrical engineer. The business was apparently a success, and debtor alleged that in August, 1920, he sold it for £1,500, at which date he owed nothing. He then took premises at 2, Palmerston Arcade, Portsmouth, and commenced a new business as an electrical engineer with £1,500 capital. In March, 1921, he was joined in partnership by another who paid £2,000 for a half share in the business. In the following month the partnership purchased an additional small business and traded at those premises and at Palmerston Arcade as electrical engineers and, subsequently, as dealers in wireless sets. The business was not successful, and in May, 1923, a deed of dissolution was executed and a receiver appointed. A claim was made against debtor for £1,717, and judgment was given against him for the full amount claimed with costs. After the dissolution of the partnership, debtor stated, he entered into a partnership with his wife. The business was successful, and in March, 1924, he instructed a firm of solicitors in London to register a limited company for the purpose of acquiring the business. Fees and costs were paid to the solicitors to the extent of about £400, but the matter was never completed. Subsequently further steps were taken and on November 17th last a company was registered with a nominal capital of £500. An agreement was entered into under which the company purchased the assets of the business for £1,998 and undertook to discharge outstanding liabilities to the extent of £300. The purchase price was to be paid by the allotment of 498 £1 fully paid up shares to the debtor and his wife, and £1,500 debentures issued to debtor's wife. No actual cash was found. Debtor did not admit that he was aware of his position until the judgment was obtained against him by his late partner, and finding it impossible to meet this liability he decided to file his petition. The case being a summary one was left with the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
David, G. J.	105	Michaelsen, R.	234
Jay Bros.	30	Stanton, H. G.	1,916
Lister, Miss E. J.	900	Torr & Co.	200

T. W. CRAWFORD, dealer in electric lamps, 25, Highbury Hill, N.—This debtor failed in August last with liabilities of £792 against assets of £19, and on January 13th he attended for public examination before Mr. Registrar Coldridge, at the London Bankruptcy Court. Replying to Mr. Waterer, Official Receiver, the debtor stated that in December, 1923, he commenced business at 41, Cheapside, E.C., as a general merchant, dealing mostly in foreign electric lamps, and trading, from March, 1924, under the style of "The Despina Co." The business was fairly successful, but upon an injunction being obtained against him in June, 1924, restraining him from infringing the patents of an English company, he closed the business. During the previous April he had opened under management, a similar business at 25, Lord Street, Liverpool, under the same trading name; that business was badly managed, and was closed in October, 1924. Another business was opened by him in September, 1924, at 32, Victoria Street, S.W., under the style of "T. Wheatley & Co."; owing to lack of capital, and also mismanagement during his absence through illness, that business was not successful, and was abandoned in April, 1925, on the landlord distraining for rent. The examination was concluded.

H. HALL, wireless dealer, 26, Egerton Street, late of 6, Market Place, and Albert Chambers, Blackburn Street, Radcliffe, Lancashire.—Receiving order made January 7th, on debtor's own petition.

G. BONNET, electrical contractor and general engineer, 2a, Camden Road, N.—Receiving order made January 12th, on creditor's petition. First meeting, January 26th. Public examination, March 17th, both at Carey Street, W.C.

J. F. CARR, electrical goods agent, 89, Aston Avenue, Fallowfield, Manchester.—Receiving order made January 13th, on creditor's petition.

J. R. BARKER, wireless dealer, Tanshelf House, Front Street, Pontefract, and 183, Kirkgate, Wakefield.—Receiving order made January 11th on debtor's own petition. First meeting, January 25th, at the Official Receiver's office, 21, King Street, Wakefield. Public examination, February 11th, at the Court House, Wakefield.

H. WILSON, electrical contractor and decorator, 56, Woodhall Avenue, and 1,057, Grangefield Avenue, Thornbury, Bradford.—First and final dividend of 3s. 1d. in the £, payable January 22nd, at the Official Receiver's Office, 12, Duke Street, Bradford.

R. L. FOGGIN (Tithebarn Radio Co., Crosby Radio Co., and High Bridge Radio Co.), electrical engineer, "Glen Avon," Fir Road, Waterloo, 63, Tithebarn Street, and 75, Crosby Road North, Liverpool, and High Bridge, Newcastle-on-Tyne.—First and final dividend of 10d. in the £, payable at the offices of the Official Receiver, 11, Dale Street, Liverpool.

T. F. FINUCANE, lecturer in wireless telegraphy, 10, Sunny Gardens, Hendon.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released January 8th.

A. E. MARTIN, electrical engineer, 104, Oldham Road, Manchester.—Trustee, Mr. J. G. Gibson, Official Receiver, released January 7th.

A. MEADOWS, electrician, The Arcade, Penzance.—Trustee, Mr. G. C. Hancock, Official Receiver, 12, Princes Street, Truro, released January 8th.

W. M. HORSFALL, electrical engineer, 7, Redcross Street, Liverpool.—Last day for proofs for dividend, January 30th. Trustee, Mr. E. W. Davies, 11, Dale Street, Liverpool.

S. H. BARDWELL (Bennett, Bardwell & Co.), electrical engineer, 23, Church Street, Basingstoke.—Last day for proofs for dividend, January 30th. Trustee, Mr. H. Ashton, Official Receiver, Midland Bank Chambers, High Street, Southampton.

F. A. FRASER, electrical engineer, Sanctuary House, 33, Tothill Street, S.W.—Bankrupt's discharge suspended for two years, until December 16th, 1927.

A. A. WATMOUGH, electrical engineer, lately carrying on business with W. Hurworth at 41, Town Street, Horsforth, and 1, Back Street, Harrogate.—Immediate discharge granted subject to consenting to judgment for £50 to be paid within one calendar month.

E. W. ADAMS, lately carrying on business as the Wireless Accessories Stores, 664, Old Kent Road, S.E.—Trustee, Mr. W. J. H. Boyle, Senior Official Receiver, Carey Street, W.C., released January 5th.

R. EMMETT (Emmett & Co.), builder, gas and electrical engineer, 249, Goldhawk Road, Shepherd's Bush, W.—Trustee, Mr. W. J. H. Boyle, Senior Official Receiver, released January 5th.

Company Liquidations.—ARTHUR LANGHAM & SONS, LTD., Holborn Viaduct House, E.C.—The report of Mr. J. Barwick Thompson, Official Receiver and Liquidator, upon the failure of this company, has been issued to the creditors and shareholders. The accounts filed under the liquidation show liabilities of £10,730 against assets of £91, and a deficiency of £10,642 with regard to shareholders, the issued capital being four ordinary shares of £1 each. The company was registered as a private company on December 28th, 1923, with a nominal capital of £10,000, to carry on business as general merchants, importers of articles of Continental manufacture, and exporters of British goods. No established business was acquired by the company, but the original object was to deal in electrical goods, household utensils, and wireless components. Continental purchases were negotiated by Mr. C. A. P. Langham, the late managing director, amounting to approximately £30,000. In May, 1924, the company made arrangements for the purchase of 10,000 wireless headphones to be delivered in fortnightly consignments. The total purchase price was £4,375, and 14 bills of exchange were accepted by the company in respect thereof. No goods were ever received, and it was ascertained that the manufacturers had gone into bankruptcy and could not execute the order. The company thereupon demanded the return of the bills, but without success. It appears that the bills have been sent to the Continent and negotiated there. Some of them have been presented to the bank by third parties who are apparently holders for value. The circumstances in which these bills have been negotiated require further investigation. The failure of the company is attributed by the directors to the inability to obtain delivery of goods from the Continent. A contributory cause was insufficient working capital, and also the bill transaction referred to. In the opinion of the Official Receiver the failure is due to lack of proper business methods, extravagant expenditure and mismanagement.

HALL & BRENARD, LTD., manufacturing radio engineers, Terminal Aerodrome, Croydon.—A meeting of creditors was held on January 11th. The chair was occupied by Mr. A. A. Baster, I.A., Croydon, who had been appointed to act as liquidator in the voluntary liquidation of the company. The statement of affairs presented showed liabilities of £3,613 and net assets of £491, leaving a deficiency of £3,122. Mr. Baster reported that the company was registered in 1923 when it acquired a concern which had previously conducted a mail order business. It had only been a small business, and the issued capital was £702. During the year to May 1st, 1924, the company made a net profit of £362. No accounts had been prepared since May, 1924. In May of last year the company was in difficulties, and in the following July a meeting of the creditors was called. It was then suggested that the creditors should agree to a scheme under which they would be issued debentures in respect of their claims. The scheme was not finally completed until December, and by that time the directors came to the conclusion that they could not carry on the business any longer, and voluntary liquidation took place. Since May, 1924, the company had suffered severely through bad debts, the total being between £900 and £1,000. He did not anticipate that the creditors would receive more than 2s. in the £. The result of the liquidation depended very largely upon the amount obtained for the machinery. The Air Council was in possession, and the assets were being disposed of. Mr. W. Baker, of the Wholesale Traders' Association, pointed out that the distraint took place after the company had gone into liquidation, and he thought the landlords should withdraw. A director of the company said that the normal turnover had been something like £2,000 a month, and it was anticipated that that would be continued. Towards the end of last year, however, the sales fell to £300 or £400 a month. The company had an enormous amount of partly manufactured stock, but it could not be realised to advantage unless the goods were completed. A resolution was passed to the effect that the voluntary liquidation of the company should not be confirmed. The following are creditors:—

	£		£
Aluminium Corporation, Ltd. ...	246	Hughes, F. A., & Co., Ltd. ...	91
American Hard Rubber Co. ...	21	Hampton Works Co.	42
Air Council	169	Iliffe & Sons, Ltd.	30
Allen Bennett Motor Co. ...	23	Judge & Priestly	22
Brooke, E., Ltd.	27	Kynochs, Ltd.	86
Barkers Advertising, Ltd. ...	53	Lowenadler, Ltd.	287
Baster, A., & Co.	165	McKechnie Bros., Ltd.	48
Buckley's, Ltd.	104	Odhams Press, Ltd.	95
Churchill, C., & Co.	21	Premier Manufacturing Co.,	
Cassell & Co., Ltd.	40	Ltd.	34
Coles, W. H.	37	Paper Goods Manufacturing Co.	56
Delta Metal Co., Ltd.	203	Siemens-Schuckert, Ltd. ...	26
Dalziel Foundry, Ltd.	117	Studeli Adam & Co.	123
Ebonestos Insulators, Ltd. ...	26	Wallace, H. W.	27
Export World	37	Young, T. W., Ltd.	235

L. WEEKES, LTD., electrical engineers, Langley Street, Luton.—A meeting of creditors was held on January 14th, at the offices of Messrs. Crew, Turnbull & Co., C.A., Luton. The chair was taken by Mr. B. T. Crew, the liquidator appointed by the shareholders. A statement of affairs prepared as at December 1st, 1925, disclosed liabilities of £4,262, there being, in addition, debentures and accrued interest of £2,857, and preferential claims and receiver's liabilities were set down at £981. The net available assets amounted to £840, leaving a deficiency of £3,421. There were also questionable assets totalling £2,848, but they were not included in the statement of affairs. The company was incorporated in June, 1916, for the purpose of acquiring the business of Mr. L. Weekes, who was identified with the British Electric Calibrated Fuse Co., and was also interested in a concern called the Safetee Controlling Appliance Co. In August, 1924, the bankers, who held the debentures, instructed Mr. Crew to make an independent report as to the position, and this was done. Mr. Crew said he was then of the opinion that an opportunity should be given to Mr. Weekes to introduce new capital into the concern, and that it would be unwise to close the business forthwith. The trading, therefore, was continued for over twelve months, but in August, 1925, creditors began to press and writs were issued. Mr. Crew was appointed receiver, and received an offer for the whole of the undertaking from Mr. Dryden. This was accepted, the larger creditors being called together and informed of what was proposed. There was a probability of a dividend of between 3s. and 4s. in the £. A creditor remarked that in a period of six years something like £15,400 had been drawn as directors' remuneration. It was decided that Mr. Crew should be confirmed as liquidator of the company. The following are creditors:—

	£		£
Baltic Scandinavian Co. (Copenhagen)	60	Grey & Marten, Ltd.	68
Bengal Foundry Co.	180	Hoare & Bellamy	34
Berger, Lewis & Sons	23	Hudson, E. A., & Co.	27
Berry's Electric, Ltd.	117	Kent, Geo., Ltd.	815
Banker, W. F.	22	Lambert, C.	38
Burrell Bros.	21	Langley Garage	31
Burgess Bros.	23	Laporte, B.	29
Burns, J., Ltd.	61	Marston Billington, Ltd.	114
Cantie Switch Co.	24	Matthew, E., Ltd.	55
Clark, Hunt & Co.	62	McKechnie Bros.	111
Coventry Malleable, Ltd. ...	49	Mica Manufacturing Co. ...	159
Croager Bros.	20	Nettlefold & Sons	27
Delta Metal Co.	80	Ormiston, P., & Son	85
ELECTRICAL REVIEW	107	Phosphor Bronze Co.	104
Ellison, George	48	Redfern, Stevens, Ltd.	22
Farmer, Stedall & Co.	23	Rigby, R.	882
Gallenkamp, A., & Co.	26	Terry, Herbert, & Son	55
Gibbs & Dandy	65	Tompkin, H., & Sons	40
Geipel, W., & Co.	62	Teale & Co.	30
Godden & Rudd	32	Wilson, C., & Sons	21

ELECTROZONE CO., LTD.—Winding up voluntarily. Liquidator, Mr. F. J. H. Boultbee. A meeting of creditors was called for January 18th at the offices of Messrs. Desmond, Page and Adams, 13, Victoria Street, S.W.

ERITH ELECTRICAL CO., LTD.—A petition for the winding up of this company has been presented on behalf of the E.S. Co., Ltd. (in voluntary liquidation), creditors, by the liquidator, Mr. B. A. Smith, and will be heard at the Court House, Eastgate, Rochester, on February 10th.

GAS & ELECTRIC SECURITIES, LTD.—First meetings of creditors and contributories, January 26th, at Carey Street, W.C.

New French Companies.—Among the new hydro-electric undertakings recently organised in France are the Société des Forces Motrices du Bearn (63, Avenue des Champs Elysées), with a capital of 10 million francs, and the Syndicat pour l'Etude des Chutes d'Eau du Bassin du Lot (54, Rue de la Boetie, Paris), capital 150,000 fr. La Société des Etablissements G. Oyer & Cie. La Radiotéléphonie Française is the name of a new company which has lately been formed in Paris (11, Rue du Rhin), with a capital of 700,000 fr., to acquire and develop a radio apparatus manufacturing business.

An American View.—In an article on "British Electric Power Developments," *Commerce Reports* says:—"Among the influences restricting the sale of American household labour-saving devices has been the high cost of electricity and the utter lack of uniformity in current supply. The present policy of large interconnected generating stations, resulting in lowered production costs, should gradually bring about the removal of this handicap."

Japanese Electrical Companies Prospering.—Reporting upon conditions towards the close of last year, the United States Commercial Attaché in Tokio stated that electrical power companies were prosperous and had declared good dividends from earnings. The sales of electrical equipment during November were quiet, but some large equipment business was in prospect. The indications were that there was eliminative competition going on among domestic manufacturers of smaller electrical equipment.

New Zealand Preference Regulations.—The revised regulations made by the Government of New Zealand with regard to the admission of British or partly-British goods at preferential rates are reproduced at length in the *Board of Trade Journal*, dated January 14th. Full particulars are given of the certificates required and the method of preparing invoices, &c.

The Contractors' Dinner.—The annual dinner of the Electrical Contractors' Association was held at the Trocadero, Piccadilly, W., on Tuesday last. A report of the proceedings will appear in our next issue.

Book Notices.—"Official South African Municipal Year Book, 1925-1926." Edited by W. P. M. Henderson and Francis G. Pau. Capetown: Francis G. Pau; London agents, Edw. G. Allen & Son, Ltd.—Contains particulars of the South African Municipalities, sectionalised both with regard to the Provinces and the various municipal concerns. A section on the electrical undertakings gives full details of the generating plants, distribution systems, tariffs, &c., for each electrical supply department. These particulars, besides being given under separate headings for each municipal undertaking, are dealt with in prepared tables under the above headings.

"Engines of High Output." By Harry R. Ricardo, B.A. P. viii + 110; figs. 38. London: Macdonald & Evans. Price, 7s. 6d. net.—This book is a treatise on the possibilities and limitations of high-speed internal-combustion engines, dealing in particular with the thermo-dynamic side of the subject. The author has avoided to a large extent the use of mathematical calculations and formulæ, although he has supported many of his views by curves and simple arithmetic.

"Marconiphone Log Book."—As its name indicates, this little pocket booklet is ruled for entering the essential particulars of radio stations heard. The valve notes and tables enable data to be ascertained quickly, not only for individual valves, but also for complete sets; a large number of arrangements of valves suitable for different types of sets have also been tabulated. The booklet is obtainable from the Marconiphone Co., Ltd.

"Vibrations in Engines and Machinery." By A. T. J. Kersey, A.R.C.Sc. "The Elements of Reinforced Concrete Design." By H. V. Crabtree. Publications of the Association of Engineering and Shipbuilding Draughtsmen. Price 2s. each.

"Quarterly Bulletin of the British Cast Iron Research Association." No. 11. January, 1926.

"Report on the Economic Conditions in Venezuela, September, 1925." By H. A. Hobson, H.M. Consul, Caracas. London: H.M. Stationery Office. Price 1s. net.

"The Story of Mathematics," by D. Larrett. Pp. 88. London: Ernest Benn, Ltd. Price, 2s. 6d. limp cloth, 3s. 6d. stiff cloth.

"The Post Office Electrical Engineers' Journal." Vol. XVIII, Part 4, January, 1926. London: ELECTRICAL REVIEW, LTD. Price 2s.

"National Economics for Britain's Day of Need," by E. Batten. Pp. xi + 217. London: Sir Isaac Pitman & Sons. Price, 5s. net.

"The *Transactions* of the South African Institute of Electrical Engineers," Vol. XVI, Part 10; November, 1925. Price, 2s.

"Turbo-Blowers and Compressors," by W. J. Kearton. Pp. xi + 333; figs. 153. London: Sir Isaac Pitman & Sons, Ltd. Price, 21s. net.

"Engines of High Output," by H. R. Ricardo. Pp. viii + 110; figs. 38. London: Macdonald & Evans. Price, 7s. 6d. net.

"Pitman's Radio Year Book for 1926. Pp. xii + 182. Illustrated. London: Sir Isaac Pitman & Sons. Price, 1s. 6d. net.

"The *Journal* of the Institution of Electrical Engineers." Vol. 64. No. 349. January, 1926. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

The Egyptian Electrical Market. — In the course of a recent article upon this subject *Commerce Reports* states that the abundance of cheap labour in Egypt has restricted the development of the market for domestic electrical appliances. Electric fans have attained a large measure of popularity, and, in spite of their higher cost, British and American fans are becoming in greater demand owing to their superior quality. Ceiling fans are extensively used in large buildings, but the possible market for small exhaust fans for offices, shops and public halls has never received the serious attention of local dealers. There is but little demand for vacuum cleaners, although a few hand-operated German machines are on the market. The low charges of hand laundries have excluded electric washing machines, but a good demand exists for electric irons, and the Germans supply the bulk of these at present. Electric kettles are sold in small numbers, and hotplates have a small but growing market. One article for which there are opportunities is the electric refrigerator, although it is handicapped by the high charges for electricity; it is thought that the demand for refrigerators is likely to grow considerably. As most Egyptian houses have no heating arrangements, electric heaters find a considerable market in the cool season. The bulk of these are of the "headlight" type (bowl fires), and of German, Italian, and French makes. At Alexandria, Cairo, and Port Said dealers in electrical appliances generally buy direct from foreign manufacturers, or, in a few cases are given consigned stocks by German manufacturers. As a general rule, electrical appliance dealers stipulate that exclusive representation shall be given for Egypt, the Sudan, Palestine, and, in a few cases, Syria. Although this is not always satisfactory it is believed that, with increasing purchasing power and lower rates, the most important dealers can adequately handle this wide territory, as the countries are closely related through customs, language, and transportation.

Doncaster and Electrical Contractors.—The Doncaster Corporation, replying to protests by local electrical contractors and the Chamber of Trade against the proposed municipal sale of electrical appliances and fittings, states that no such sale is intended unless the contractors charge unreasonable prices.

The W.R.A. and Trade Organisation.—We are requested to give publicity to the following:—"In the present crisis in the organisation of the industry, the Wireless Retailers' Association feels that a statement of its views on certain important matters, which not only relate to the organisation of the trade as a whole, but which directly concern dealers, may be helpful in clarifying the general position and in defining issues.

"The first is that the consensus of opinion amongst retailers is that their interests should be represented by an independent Association of their own. This fact has been ascertained beyond question by voluntary statements, exhaustive inquiries and the issue of a questionnaire on the subject, in the course of which practically no dissentients from this view were encountered.

"It will be generally admitted that in the present stage of evolution of the industry the problems confronting each section are more than sufficient to tax the whole attention, energies and resources of any body representing it, without attempting to encroach on other interests. In these circumstances, it is submitted that the only logical course is for each section to devote its entire efforts to the organisation of its own constituents.

"The second is that a far closer co-operation between the manufacturing and retailing sections of the industry than has hitherto obtained is imperative; but this can only be really effective when each section is thoroughly organised.

"The W.R.A. has never ceased to proclaim its desire for active co-operation, and any scheme for the organisation of the manufacturers' section of the industry which embodies the principles outlined, can be assured of receiving the unqualified moral and active sympathy of this Association.

"The third point is that there should be no control of discounts, and that preferential treatment should be excluded.

"The Executive of the Wireless Retailers' Association is assured that the recognition of these principles is vital to the success of any scheme for reorganisation which the manufacturers may have under contemplation, and urges those with the welfare of the industry at heart to use all their influence to secure their adoption, believing that it is only in this way that the trade can be organised on a sound, equitable and permanent basis."

For Sale.—By direction of Messrs. C. J. Thursfield and Co., Ltd., manufacturers of electrical fittings, Birmingham, who are rearranging their works, Messrs. E. L. Stevens and Champion will sell by auction on January 28th, at Cecil Works, 42, Clement Street Parade, Birmingham, a stock of high-class new electrical fittings, &c. Mr. H. J. Shaw will sell by auction at 13, High Holborn, W.C., on February 3rd, a manufacturer's stock of wireless goods and materials. (See our advertisement pages to-day.)

Social Events.—A New Year's party and dance was recently given by Mr. Arthur Cozens, of Ascot, Camberley and Clacton, to his staff and friends, about 200 being present.

The annual dinner of the staff and friends of Messrs. Ernest F. Moy, Ltd., took place at the Britannia Hotel, Camden Town, on January 16th. After dinner and the loyal toast, Mr. W. B. Dykes proposed the health of the company and Mr. E. F. Moy responded. The visitors' toast was proposed by Major C. G. Fox and replied to by the Mayor of St. Pancras (Ald. Dr. E. A. Gregg, J.P.).

The annual fancy dress carnival and dance of Messrs. Johnson & Phillips, Ltd., was held on January 8th in the Woolwich Town Hall, and there was a good attendance of members of the staff and their friends. The prizes were the gift of the company's Australian branch manager, Mr. E. A. Kinsley, who was unavoidably absent. The costume which won one of the prizes was that worn by Mr. H. D. Parsons, of the publicity department, representing "One of the J. & P. Pages"—a familiar feature of the advertisement section of the ELECTRICAL REVIEW. The prizes were presented to the winners, on behalf of the donor, by Mrs. J. Macgregor and Mrs. C. Stewart.

Calendar.—A calendar sent us by Mr. W. H. SQUIRE, 31, Sweyne Avenue, Southend-on-Sea, depicts a young lady with a bunch of violets. Monthly date slips are provided.

Lighting and Power Notes.

Ashby-de-la-Zouch.—STREET LIGHTING.—The Urban District Council is to convert the street lamps in its area from gas to electric lighting at a cost of £340 per annum for the first five years, and £313 during the next five years.

Ashton-in-Makerfield.—LOAN.—The Urban District Council has applied for sanction to a loan of £8,480 for electricity purposes.

Ayr.—ELECTRICITY SUPPLY.—The engineer and general manager of the Ayrshire Electricity Board has recommended various improvements, including new sub-stations and transformers, at a cost of £25,000, and the Board has agreed to carry out the scheme. New distributor cables to replace the existing ones are to be laid where the cables are found to be in a bad condition.

Bangor.—NEW ELECTRICITY CHARGE.—The Electricity Committee has decided that electricity consumers of not less than 3,000 kW per annum shall be offered the following tariff as an alternative to the present rate of 8d. per kWh for the first 1,000 kWh per quarter and 7d. per kWh for the next 500 kWh, &c. :—For electricity used for lighting between four p.m. and eight p.m., 9d. per kWh. For electricity used between eight p.m. and 4 p.m. next day, 4d. per kWh, provided that not less than 2,000 kWh per annum shall be used during the hours from four p.m. to eight p.m.

Barnes.—PRICE REDUCTIONS.—The Urban District Council has approved the following revised charges for electricity as from the meter readings in March next :—Private lighting : 4d. per kWh. Lighting, heating and cooking (domestic purposes) : 10 per cent. per annum of the rateable value of premises, plus 1d. per kWh during the winter quarters, and ½d. per kWh during the summer quarters. Power (other than contract), heating and cooking : 2d. per kWh, with discounts up to 37½ per cent. Public lighting : A reduction of £1 per annum for each post in side streets.

Birkenhead. — NEW ELECTRICITY CHARGES. — The Town Council has approved the new scale of electricity charges for domestic purposes, outlined in our issue of January 8th. The new scale will apply only to premises of a minimum rateable value of £18.

Blackburn.—LOANS.—The Town Council has given approval to an application for sanction to the following loans :—Mains, £93,000; services, £45,000; sub-stations, £16,500; change-over of system from d.c. to a.c., £7,500; purchase of showrooms, &c., £14,560.

Bognor.—STREET LIGHTING.—A scheme for lighting the main thoroughfare of the town by electricity is being carried out by Mr. H. A. Harding, electrical engineer to the Bognor Gas-Light & Coke Co. Central suspension lamps of 500 W are being used.

Bradford.—MAINS EXTENSIONS.—The Electricity Committee has authorised the following works :—Cables from Four Lane Ends to Allerton and Sandy Lane, and erection of transformer chamber at Sandy Lane, £15,241; cables in Low Moor district, £3,517.

Chesterfield.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £4,548 for wiring consumers' premises.

Continental.—SPAIN.—The programme of the Echevarrieta group for the utilisation of the Douro waterfalls seems to present a better aspect owing to the attitude of the present Government. The proposed works include two waterfalls of a maximum yield of 266,000 h.p. and a force of 126,000 h.p. at low water and three waterfalls with a constant power of 46,366 h.p., all in Spanish territory. The two waterfalls studied in connection with Portugal will supply about 400,000 h.p. all the year round.—*Reuter's Trade Service* (Madrid).

Dalkeith.—TRANSFER OF UNDERTAKING.—The Town Council is to take over the electricity undertaking on April 1st next.

Derby.—WIRING OF SMALL HOUSES.—The Corporation Electricity Committee has allocated £5,000 from the appropriation account towards the cost of wiring Corporation houses for electric light.

East Ham.—NEW ELECTRICITY CHARGE.—The Electricity Committee has recommended to the Council that the following domestic tariff be approved as an alternative charge for electricity supplied to premises used solely for residential purposes :—A fixed quarterly charge varying from 16s. for a five-roomed house to 37s. for a 12-roomed house, plus 1½d. per kWh for energy consumed for all purposes, with a discount of 5 per cent.

Fraserburgh.—ELECTRICITY SCHEME.—A special committee of the Town Council has considered a proposal for an electricity supply and has recommended that if electric lighting be introduced it should be by the Council in preference to an outside company. The Council is to prepare a scheme.

Gelligaer.—ELECTRICITY EXTENSIONS.—The Urban District Council is applying for sanction to the borrowing of £10,059 for its electricity undertaking, and £5,000 for mains and services.

Glasgow.—PROGRESS AT DALMARNOCK STATION.—Satisfactory progress continues to be made with the equipment of the new section of the Corporation's Dalmarnock power station. The boilers are in course of installation in No. 3 boiler house, while the first of the four 20,000-kW Parsons turbo-alternators is approaching completion and is expected to take up its share of the load by about the end of the present month. When the present extension is complete, approximately 80,000 kW will be added to the present capacity of 100,000 kW.

Gravesend.—LOANS.—The Electricity Committee is applying for sanction to loans of £4,027 for foundations for turbine and condensing plant, £4,216 for switchgear, and £6,816 for a Yarrow boiler.

Horsham.—WIRING OF SMALL HOUSES.—The Urban District Council has applied for sanction to a loan of £1,000 to cover the estimated cost of a scheme for the wiring of premises for consumers. It is proposed to charge a rental of ¾d. per point per week, and a scale of charges on this basis has been drawn up.

Holbeach.—ELECTRICITY SCHEME.—The Urban District Council has decided to adopt a proposal to obtain an electricity supply from the Boston Electricity Supply Co. The company is to act as the distributor, and the maximum price is to be 10d. per kWh. The Council is to have the option of taking over the undertaking on a special or "goodwill" basis at the end of 21 years, and on the ordinary basis at the end of 42 years.

India.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Indian Textile Journal*, hydro-electric plant totalling 91,325 h.p. has been installed in the country, the largest installations being the plant of the Tata Hydro-Electric Power Supply Co. (50,000 h.p.), and Cauvery power scheme (22,650 h.p.). The following plants are under construction :—Andhra Valley Power Supply Co., 64,000 h.p.; Tata Power Co. (first stage only), 75,000 h.p.; Burma Mines, Ltd., 9,750 h.p.

Irish Free State.—WATERFORD.—At a recent meeting of the directors of the Waterford Chamber of Commerce it was agreed to instruct the Chamber's solicitor to oppose the Waterford municipal electric lighting scheme at the forthcoming Government inquiry. It was felt that the proposed scheme was inopportune on account of the present high city rates, and the prospect of electricity being supplied from the Shannon scheme within the next few years.

Japan.—ELECTRICAL DEVELOPMENT.—The Nügata Denki K.K. proposes to erect a hydro-electric power station with a capacity of 20,000 h.p. on the Shinano river.

The Yamagata Denki K.K. has decided to erect a steam power station at Shiogama-Machi, Miyagi-ken, at a cost of 540,000 yen, the work to be completed by next winter.

Kendal.—LOANS.—The Town Council has applied for sanction to loans of £3,000 for mains, £500 for services, and £1,200 for a battery room.

Lexden and Winstree.—ELECTRICITY SUPPLY.—The Rural District Council has decided to support the application of Colchester Town Council for a fringe Order to supply electricity in the rural area.

London.—CITY ELECTRICITY CHARGES.—The Charing Cross Electricity Supply Co., Ltd., announces that the following scale of charges for electricity will have effect as from January 1st last :—Lighting : In the winter quarters, 6d. per kWh for the first 7 kWh per 30 watts connected, and in the summer quarters 6d. per kWh for the first 3 kWh per 30 watts connected, and 2½d. per kWh for all energy consumed in excess of such quantities. Power : 2d. per kWh. Heating : 1½d. per kWh.

HACKNEY.—According to *The Times*, at a town's meeting on January 16th approval was given to a Bill, to be promoted by the Borough Council in the next session of Parliament, to confer additional powers on the Council in relation to its electricity undertaking. The measure contains a clause which will enable the Council to obtain land for a new sub-station at a cost of £86,000, which is the only capital expenditure contemplated under the Bill.

Luton.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to the borrowing of £18,175 for feeders, £6,955 for services, &c., and £7,583 for sub-station equipment.

Malvern.—PRICE REDUCTION.—The Urban District Council has reduced the charge for electricity for power and heating by 1d. per kWh.

Middlesbrough.—PROPOSED NEW POWER STATION.—The Cleveland and South Durham County Electric Power Company has written to the Electricity Committee giving revised terms for a new bulk supply agreement to come into force on November 1st, 1927, the terms being based on the Corporation's taking the whole of its electricity requirements from the company's mains, the Snowdon Road power station being shut down, with the exception of the two gas sets, which would be utilised only for stand-by purposes. The engineer has submitted a report on the question of electricity supply and has recommended that the Corporation should erect a new power station with a capacity of 9,000 kW. At a meeting of the Corporation on January 12th it was decided that the borough electrical engineer's report should be adopted, and that the Cleveland and Durham County Electric Power Co. should be informed that the Corporation was satisfied that it could produce electrical energy at a lower price than that quoted by the company, and that the Corporation had accordingly decided to proceed with the erection of its own generating station for supplying to its consumers when the agreement with the company terminates in September, 1927. The Town Clerk has been authorised to make application for approval to the scheme, and for sanction to a loan of £141,346, being the estimated cost thereof.

Milton Regis.—ELECTRICITY SUPPLY.—The Urban District Council has decided to apply to the Kent Electric Power Co. and others to supply electricity to the district and has asked the Milton Rural District Council and the Sittingbourne Urban District Council to co-operate in the matter.

Musselburgh.—PURCHASE OF UNDERTAKINGS.—The Town Council has appointed a special committee to report on its powers under Provisional Orders to acquire the local electric light and tramway undertakings in view of the fact that the Council's option to purchase expires in June.

Northern Ireland.—CASTLEBLANEY (CO. MONAGHAN).—The Urban District Council has approved an agreement with a Belfast firm for a public installation of electric lighting, the scheme to be completed by September next.

NEWRY (Co. DOWN).—The Urban District Council has adopted the revised estimated of £17,500 for the installation of a public electric lighting scheme, as submitted by Mr. P. A. Spalding, municipal electrical engineer, Dundalk.

Queensbury.—ELECTRICITY SUPPLY.—The Urban District Council has approved a plan submitted by the Yorkshire Electric Power Co. of proposed overhead lines in the district.

Rhyl.—LOAN.—The Urban District Council has applied for sanction to a loan of £10,000 for electricity purposes.

Shrewsbury.—ELECTRICITY EXTENSIONS.—The Town Council has approved a scheme for extensions at the electricity works which includes the erection of a new engine room, and the installation of a 400-kW generator, to be followed, probably immediately on the completion of the first set, by a second similar set. The building and installation of the first set is estimated to cost £15,000. The scheme has been approved by the Technical Sub-Committee of the West Midlands Electricity District.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Lancashire Electric Power Co. to supply electricity in the urban district of Walton-le-Dale.

Application has been made by Mr. J. A. Purves for a Special Order for the supply of electricity in the urban district of Brampton.

Tadcaster.—ELECTRICITY SUPPLY.—The Rural District Council has consented to an application by the Electrical Distribution of Yorkshire, Ltd., for a Special Order to supply electricity within the Council's area on condition that a fixed time is to be stated for the supply of electricity to be available.

United States.—ELECTRICAL DEVELOPMENT.—According to *Power*, the rapidly increasing load supplied by the Niagara system and the necessity of maintaining a proper balance in the supply of steam and hydro-electric power have made it necessary to add a 60,000-kW turbine to the equipment of the River Station of the Buffalo General Electric Co. The station at present includes three 20,000-kW and one 35,000-kW turbo-generators.

Announcement has been made by the Byllesby Engineering and Management Corporation, that an order for eight 13,500-h.p. waterwheels has been placed with the Allis-Chalmers Manufacturing Co. This equipment is for the new Falls of the Ohio River station being built on the Ohio River at Louisville.

The growing demand for electric power in Florida has caused the completion of negotiations by the Florida Power & Light Co. for the purchase of land on the New River near Fort Lauderdale, on which work will be begun immediately for the construction of a new steam generating station to have an ultimate capacity of 100,000 kW. Orders have already been placed for two 25,000-kW high-pressure steam turbines, boilers and auxiliary equipment for this station, and it is expected that the first unit of the plant will be installed and in operation by the end of 1926 or early in 1927. The station will be equipped to burn either coal or fuel oil or both.

Watford.—LOAN.—The Electricity Committee is to apply for sanction to a loan of £20,378 for sub-stations, switchgear,

Tramway and Railway Notes.

Bradford.—TRACK RENEWALS.—The Tramways Committee, after considering a report submitted by the city engineer on track reconstruction work during the coming year has recommended the following renewals:—Manningham Lane, from North Parade to Oak Lane, £27,715; Barkerend Road, from Otley Road to Byron Street, £14,740; and Barkerend Road, from Rushton Road to Leeds Road, £8,262; total, £50,717.

Continental.—NORWAY.—An underground railway is to be constructed by the City of Oslo, the capital of Norway, from Majorstuen, a station on the Holmenkollen Railway in the suburbs of Oslo, to the centre of the city. The tunnel will carry the trains of the four lines handling the heaviest traffic from the surrounding districts to Oslo, namely, Holmenkollenbanen, Smestadbanen, Sognvandsbanen, and Baerumsbanen.—*Commerce Reports.*

AUSTRIA.—The electrification of the Austrian Federal Railways is progressing in proportion to the release of funds from the balance of the League of Nations credits set aside for investment purposes. In addition to the 56 electric locomotives ordered last year, the greater number of which are already in operation, 50 additional locomotives have been ordered, delivery to be made progressively until the end of 1927. It is planned to reinforce the principal portions of the main lines at a future date, more especially the line Vienna-Salzburg, in order to permit the use of a stronger type of locomotive.

FRANCE.—The Paris correspondent of the *Daily Mail* reports that the Paris Municipal Council is to remove a number of the main tramway tracks running to the centre of the city and to confine the working of other tramways to early morning and shopping hours. It is proposed by the Council that, as a first step, the tramway terminus at the Opera end of the Rue du Quatre Septembre should be abolished and a new terminus for these tramway lines found outside the congested area. The same measure is to be adopted for some of the many lines which converge towards other parts of Paris, including those near the Gare du Nord. During the hours when tramway services will be prohibited motor-omnibuses will be substituted.

Dundee.—PROPOSED PURCHASE OF UNDERTAKING.—The Town Council has under consideration a proposal to acquire the undertaking of the Dundee, Broughty Ferry and District Tramway Co., Ltd., at a cost of £85,000.

Irish Free State.—DUBLIN.—The scheme for the extension of the Dublin tramway service to Lucan has successfully passed the negotiation stage, and as soon as the necessary legal formalities are completed the work of relaying the track to the wider tramway gauge will be commenced. Negotiations are also proceeding satisfactorily with the object of extending the tramway service from Dublin to Blessington, and it is anticipated that in the near future the two districts of Lucan and Blessington will be linked up with the Dublin tramway system.

Liverpool.—FAILURE OF NEGOTIATIONS.—It is reported that negotiations for the acquisition by the Corporation of the Waterloo tramway system have failed, and that a contract has been signed for a motor-omnibus service between Seaforth and Great Crosby for a period of five years.

Manchester.—TRANSPORT IMPROVEMENTS.—According to the *Electric Railway and Tramway Journal*, the Corporation Tramways Committee is contemplating the expenditure of £320,000 for the following purposes:—£14,000 for motor omnibuses; £105,000 for permanent way, new buildings, &c., £170,000 on car works extensions; £12,000 on equipment; and £15,000 for machinery for car works. The proposed extensions will practically double the capacity and the area of the car sheds. The Corporation intends to resume the construction of its own tramcars, the pre-war output of which was one car weekly.

Stretford.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £10,373 for tramway construction and electrical equipment.

United States.—RAILWAY ELECTRIFICATION.—According to the *Electric Railway Journal*, Vice-President Le Boutillier, of the Long Island Railroad, on December 24th laid plans before Mr. R. Nixon, chief engineer of the Public Service Commission, for further electrification of the Long Island Railroad from 1926 to 1929, at a cost of $12,600,000. The improvements proposed are as follow:—1926. Electrification of the Bay Ridge Division and the Bay Ridge yards ($4,040,000). 1927. Electrification of the Montauk Division, from Long Island City to Holban yards and the yards at Long Island City, Blissville, French Pond, and Holban ($6,010,000). 1928. Electrification of freight sidings on the North Side Division, the main line between Long Island City and Jamaica and on the Atlantic Division ($1,205,000). 1929. Electrification of the remainder of freight sidings in territory now electrified for passenger service ($595,000).

Uruguay.—RAILWAY ELECTRIFICATION.—According to *Commerce Reports*, the management of the Ferrocarriles y Tranvias del Estado in Uruguay has under consideration the partial electrification of the Ferrocarril del Norte (Northern Railway) from Montevideo to Santiago Vazquez on the Santa Lucia River, a distance of 19.5 km. La Transatlantica, a German street-car system of Montevideo, and the railway management are negotiating an arrangement whereby the company will operate a street-car service over the track of the Northern Railway in lieu of building a new and competitive line.

Telegraph and Telephone Notes.

Australia.—NEW CABLE.—There sailed from Greenwich, on January 15th the cable ship *Colonia*, the largest cable ship in the world. She is to lay a duplicate cable over the 1,800 nautical miles between Cocos (Keeling Islands), in the Indian Ocean, and Fremantle, Australia. More than ordinary interest attaches to the operation because the cable is of the new loaded type, and is the first British owned and manufactured loaded cable to be put down. It is the property of the Eastern Extension, Australasia and China Telegraph Co., Ltd., one of the Eastern Associated Telegraph group, and will be operated by British interests. Whereas the existing line from Cocos to Freemantle has a working capacity of 145 letters a minute, the new line is designed for a speed of 2,100 letters. This result has been obtained by winding round the core strips of a new metal capable of carrying additional current. The new cable is not in substitution, but in duplication, of the existing facilities, and will give the Eastern group yet another route connecting Europe and Australia. That means developing further the lines between Freemantle and Adelaide, a matter now under consideration. The *Colonia* is expected to arrive at Cocos about the middle of February and to complete the laying of the cable at Freemantle early in March. With the *Colonia* has sailed, as a junior cable engineer, Mr. John Jocelyn Denison-Pender, son of Mr. John C. Denison-Pender, vice-chairman of the Eastern Telegraph Co., and grandson of Sir John Denison-Pender, the chairman. Young Mr. Denison-Pender is thus the fourth generation of the Pender family to be actively interested in cables.

(*Continued on page 143*)

A Modern Cable and Rubber Factory.

A Visit to the Works of the St. Helens Cable and Rubber Co., Ltd.

THE St. Helens Cable & Rubber Co., Ltd., derived its origin from the firm of Messrs. W. & J. Glover and Co., whose works were at St. Helens, from which town the first-mentioned firm takes its present name. Messrs. W. & J. Glover & Co. were well-known manufacturers of wire and wire ropes, and had an extensive connection amongst the collieries. This business, together with that of Messrs. Hanchett & Co., Ltd., rubber manufacturers, was acquired by the St. Helens Cable Co., Ltd., which was registered in 1899 to take over the business of cable, wire-rope and rubber manufacturing, with works at St. Helens and Warrington. At the former place the manufacture of wire ropes was continued, and also the drawing of iron and copper wire, while the Warrington Works was devoted to the manufacture of electric wire and cables and also rubber tires and other mechanical rubber goods. The development of the pneumatic and solid-tire industry eventually led to the introduction of the cab-tire sheathed cable, with which probably all electrical engineers associate the name of the firm in question. With the commencement of the making of rubber tires the name of the undertaking was once again changed, and it became as it is styled at present, the St. Helens Cable & Rubber Co., Ltd. In 1923 the increase in the firm's productions rendered it necessary to establish a larger factory on more modern lines, and after a considerable search the present factory at Slough was chosen. It is part of the huge works built by the Government during the war which were to have been used for the repair of automobiles, and which is now owned by the Slough Trading Company.

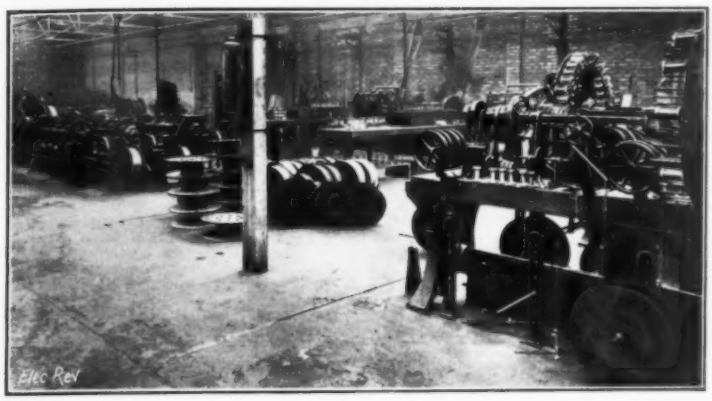


Fig. 1.—Fine-Wire Stranding Machines.

Although the manufacture of "C.T.S." cables forms the principal feature of interest in the works, at any rate from the point of view of the electrical engineer, many other products are of interest, including rubber insulating mats, gloves, and overshoes; the making of ebonite is also a special feature. The premises, which cover an area of 258,000 square feet, are of modern construction with only one floor level and good natural lighting, bordered at opposite ends by sidings of the G.W.R. These are each run in a covered way flanking the premises with the necessary loading and unloading platforms on the same level as the factory floor. The north end is arranged as the import section and the opposite end forms the export branch, the whole of the factory being set out so that the raw materials received at the import end travel as nearly as possible in a straight line in the works through the different processes of manufacture till they reach the export room in the completed stage.

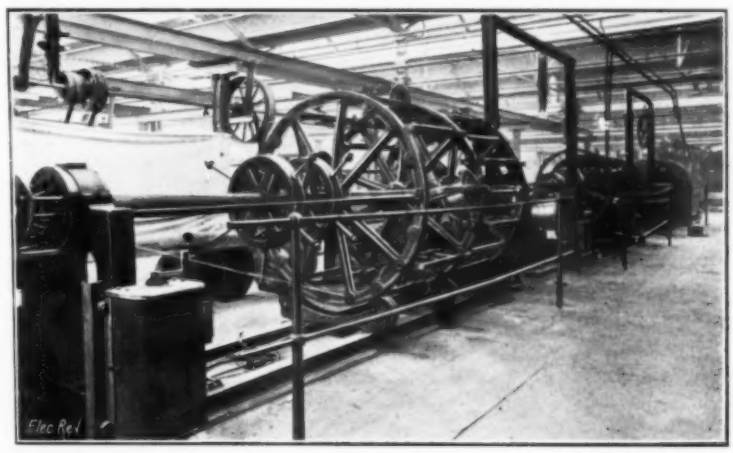


Fig. 2.—Large Stranding Plant.

The factory proper is arranged in two main sections, one devoted chiefly to the preparation of rubber for its many uses, and the other to cable stranding, covering, &c. All the wire used is received already drawn to the required sizes from one of the associated companies of the firm. The first operation in the making of cables, stranding, is effected immediately inside the main factory at the import end. Fig. 1 shows some of the fine-wire stranding machines, and fig. 2 is a view of some of the larger machines employed in this process. In the first-mentioned illustration the machines were dealing, when we recently visited the works, with flexible cord containing up to 70 wires. Adjacent cotton-covering machines, fig. 3, deal with wires required for instruments,

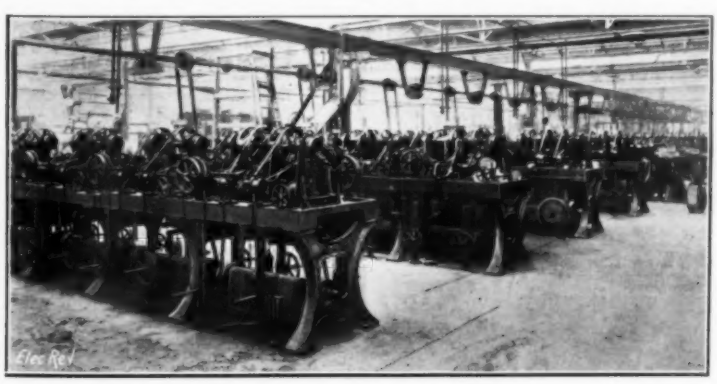


Fig. 3.—Cotton-Covering Section.

&c. Bunching machines, in which the strands are merely assembled without twisting, for the sake of flexibility, form a feature in this portion of the works. A twinning machine, which can be adapted for either stranding or twinning operations, is another item of interest; it follows closely the design of a special machine which is used for the combined operations of twinning multi-core cables and taping between the cores as they are assembled. The latter operation is employed in the making of C.T.S. cable so as to ensure that, besides surrounding the cable as a whole, the cores are each separately encircled with a coating of the sheathing material. Heavy-stranding revolving-bobbin machines are also installed for dealing with the larger cables.

The insulating of the cores is an interesting branch of the work. Rubber-taping machines are employed in this process, the bare cores being taped with pure-rubber strip. It is interesting to note that the ends of the rubber strip are welded together when necessary by simply beating them together in a similar manner to that employed in iron forge-welding. The insulating rubber is supplied from the rubber department in different colours, indicating the various classes up to the 2,500-megohm grade. The colours are all of light shades, enabling the tester to easily discern any foreign matter or other defects in the rubber during the two examinations to which it is subjected when it is in sheet form. Other covering machines are of the grooved-roller type, fig. 5, in which the core is sandwiched between two rubber strips, and on which both the pure-rubber and the compounded-rubber insulation, the separator and the jacket, are applied by one machine. Other machines, which deal with h.p. cables, serve the cores with two layers of each insulation.

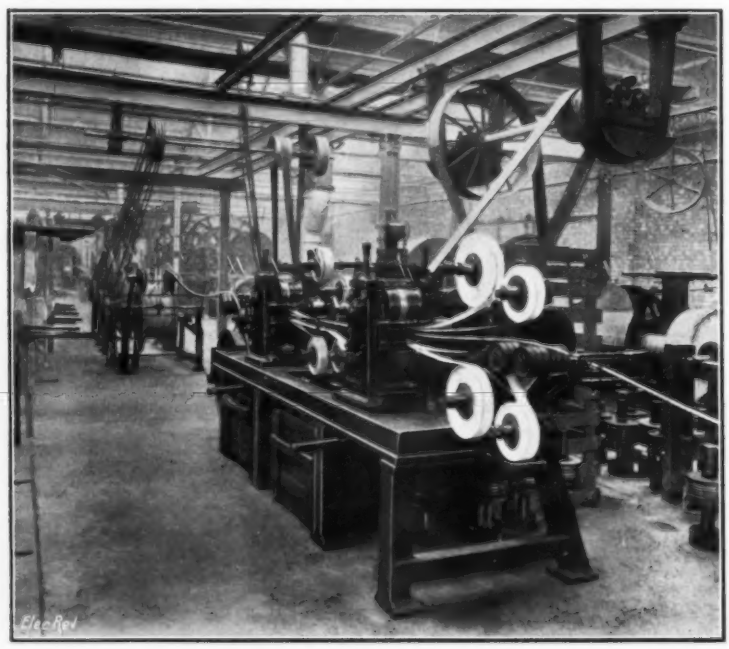


Fig. 5.—Grooved-Roller Rubbering Process.

A considerable number of braiding machines of the vertical type are also installed to deal with ordinary v.i.r. cables. The latter are finally dealt with in colouring troughs. Two large laying-up and armouring machines, on which colliery cables are dealt with, form another important part of the equipment. These are of the revolving-bobbin type.

The application of the cab-tire sheathing is effected in the rubber preparation department. Here forcing machines, fig. 4 of various sizes are employed on this work. The "cab-tire" is fed into these machines at the top; it is "minced" and applied hot to the cable by means of a die-mould through the centre of which the cable is drawn at right angles to the direction of application. A fine thread is drawn in the sheathing of all cables of this class, as a maker's distinction mark. As the sheathed cable is received from the machine it is paid out on to a revolving circular tray, where it is covered with french chalk; later on it is vulcanised.

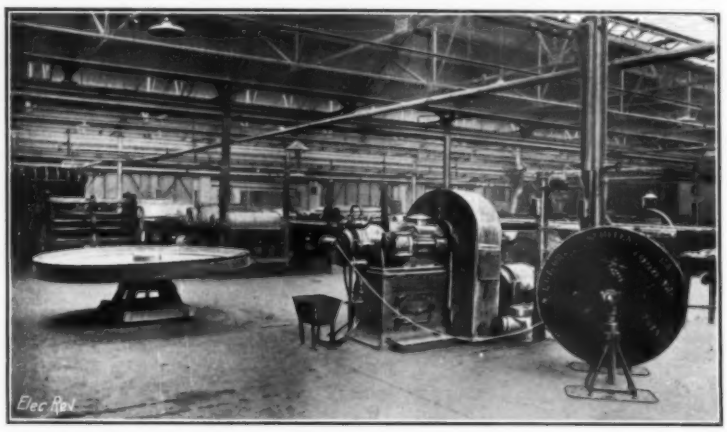


Fig. 4.—Rubber-Forcing Machines.

Of particular interest is the rubber department. Here rubber is received from the Malay States in two grades, refined rubber, which has been collected direct from the tree cups, and a coarse grade, or "browns," which consists largely of the leakage gums which run down the tree bark. The first-mentioned grade is used for insulating, and is received in sheets packed in wooden cases, as is the crude rubber, which is employed in the sheathing. The sheets are hung on racks in large drying ovens through which a current of warm air is circulated by means of a fan placed on the top, which sends the air first through a steam-heated coil.

The rubber is first dealt with, after drying, by masticating machines, fig. 6, on which the material (raw rubber) is applied to a pair of steel rollers, similar in construction to an ordinary mangle, except that they are placed side by side. The rollers, which are steam heated, travel at different speeds, so that the rubber, which is left adhering to the rollers for several hours, is constantly being "churned." According to the class of compounded rubber or ebonite required, sulphur, zinc oxide and various "drugs" are fed into the revolving mass periodically during the process. The mixed compound is run through calenders, fig. 7, into sheets of various thicknesses according to the purpose for which they are required. Thin sheets prepared for the manufacture of gloves, insulating tape, &c., are afterwards rolled in cloth until the rubber is dry. The calenders are of the triple steel-roller type, the rollers being heated by means of steam.

Another interesting operation is that of rubber spreading. The pure rubber for insulating tape is treated by this process, which is effected in an entirely separate building on account of the quantity of naphtha used. The rubber is first put into tubs, where it is served with naphtha until it becomes a plastic substance, when it is suitable for application to the spreading machines

(fig. 8). A pair of rollers force the mixture under a knife-gauge on to a steam-heated table, on which the thin sheet of the mixture is spread on to a travelling

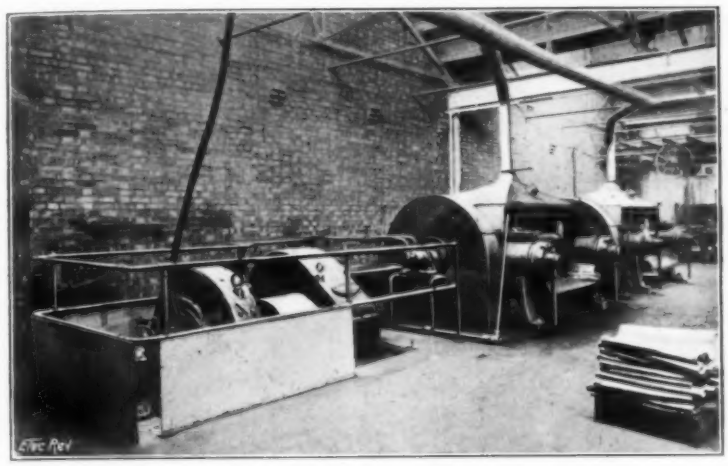


Fig. 6.—Rubber-Masticating Machines.

cloth. Other processes, in which the mixture is forced into the mesh of canvas, result in a reinforced rubber for such articles as pneumatic tires.

Three large vulcanising tanks for dealing with cab-tire cables are installed. Matting presses also form an important feature of the works; in these rubber mats are vulcanised and shaped in one operation. The press pans are steam heated and the face plates have various corrugated designs, giving the required finish to the product. The press is operated under hydraulic pressure. Similar machines to these are used for the preparation of ebonite sheets. A fully-equipped testing room is provided to deal with all the finished electrical products. A 25-kW generator feeds a static transformer from which pressures up to 100,000 V can be obtained. Two 600-V "test-tube"-type accumulators are also installed for the purposes of dielectric tests, &c. An interesting piece of apparatus in this department is a sheet-ebonite testing device, a patent of the firm. It consists of two rollers of small diameter, held about 1/16th in. apart in a suitably insulated frame and handle. A circuit in which a mirror galvanometer is conveniently arranged applies a pressure of 600 V between the two rollers. The latter are wheeled over the surface of the ebonite so that both of their peripheries are in contact with the sheet surface. Any appreciable defect, such as a piece of conducting material in the compound, will result in a current passing between the rollers, giving rise to a deflection of the galvanometer. The water tanks for cable-immersion tests are conveniently placed adjacent to the test room.

One may be justified in assuming that in a rubber factory a fully-equipped laboratory is at least as essential as in any other industrial concern. For each consignment of rubber imported, fresh data for the mixing operations have to be prepared experimentally, because the different rubbers vary in quality to such an extent. Such a department forms a particularly interesting and important branch of the St. Helens works. It is equipped practically as a miniature factory. A masticator, vulcaniser, and hot presses, &c., enable the main and essential processes of the factory proper to be undertaken on a sufficiently large scale to allow the necessary data to be determined. An important piece of apparatus is a tensile testing machine, which registers both the breaking strain and the stretch of samples of rubber automatically. The necessary "pull" is applied to the rubber by means of a small electric motor acting on a highly-geared chain-pulley system; the recording is effected by means of a similar gearing. Many extended time experiments on samples of cab-tire sheathing add to the interest of the laboratory. Pieces of the material are bottled in various acids and other solutions, where in some cases they have remained for several years with no apparent ill effects. A small shop is set aside for the preparation of samples of the firm's products. Some recent additions to these are ebonite sheeting prepared in attractive designs, such as imitation marble, and the like.

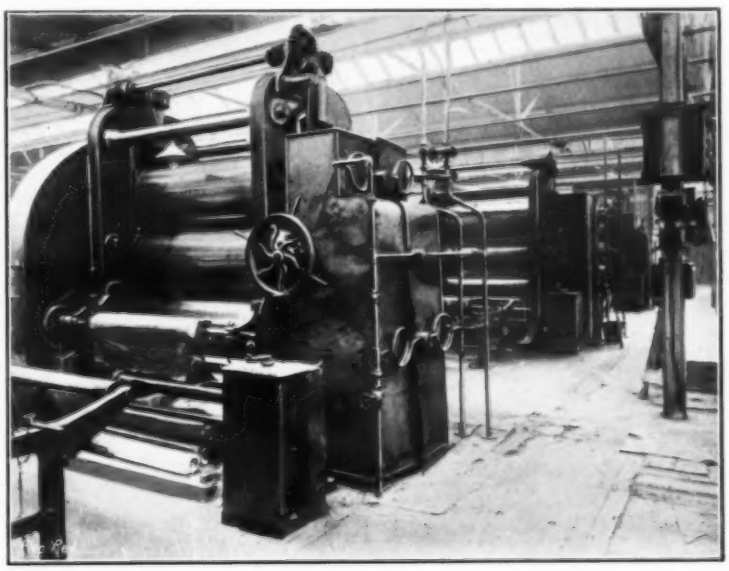


Fig. 7.—Rubber-Rolling Callenders.

The whole of the machines throughout the factory are electrically driven, and in most cases, especially with the larger plant, figs. 6—8, individual motor drive is employed. The motors, some of which were originally installed in the Warrington works, are all d.c. machines and the electricity supply, received from a local company's power station on the estate at 460 volts, is a.c., 3-phase. A transforming and converting station affords the necessary means of conversion and distribution. It is equipped with three static transformers, supplying three rotary converters, and a 9-panel generating and dis-

Fig. 8.—Spreading Machines.

tribution switchboard. It is interesting to note that the transformers were originally in use at the previous works, where they dealt with an incoming h.p. supply. They have been re-wound to reduce the present supply pressure to that necessary, 440 V, for the rotaries. Mechanical and electrical workshops are equipped with lathes and other repair gear required to effect the repairs to the running plant, &c. Small outhouses constitute a carpenter's shop and forge for similar purposes. A hydraulic installation serves the vulcanising presses, &c. Pan-type vulcanising tanks to deal with carriage tires are also provided for by this installation. A feature of the vulcanising equipment consists of special tanks in which the Peachey process for rapid vulcanising is employed, the principle being the effect produced by two gases impinging on the material.

Apart from the manufacture of the main products mentioned, numerous articles of all descriptions are prepared from the rubber compounds, including many electrical safety appliances. Specially constructed insulating gloves are a recent development. These are coated at the parts most subjected to wear with an extra layer of red cab-tire material, which, when worn through to the black material beneath, gives a warning of its wear to the user. A jointing "N" tape is another speciality; this consists of a layer of compounded rubber faced with one of the pure material, the object being to combine the high insulating properties of pure rubber with the good mechanical properties of the compounded substance. It is interesting to note that there is still a large output of solid cab tires to India.

The electrical installation is wired throughout with C.T.S. Mains are run externally along the walls of the main building so that they are exposed to the sun and all weathers. Inside the factory mains are run along the steel girders, and in many cases, as shown in fig. 7, the motor leads from the starters, &c., are run down supporting girders and buried direct in the concrete flooring.

It is interesting to note that the ebonite department is at times called upon to turn out as much as 5 tons per week of sheet alone. By far the greater part of the floor space in this department accommodates plant for the manufacture of mouldings, accumulator cells, loud-speaker horns, &c.

Although a considerable number of the employés are housed on the estate, the majority live in the town of Slough—about two miles away. A service of 'buses

Fig. 2.—Kerstelenbach Viaduct.

runs to and from the estate at convenient times, of which many take advantage. Efforts are made to provide social attractions for the employés. The firm runs its own football, tennis, cricket and bowling clubs, and a football ground is situated quite near the works. A club room situated in Slough proves a great attraction for many of the hands.

An association of the occupiers of the various factories, &c., throughout the estate has been the means

Fig. 1.—Turbine Room, Amsteg.

of adding considerably to the comfort of everybody working there. One example of the useful work done in this direction is the lighting by electricity of the main Bath Road between the estate gates and Slough.

Swiss Electrification.

THE first illustration on this page shows the interior of the turbine room of the Amsteg hydro-electric generating station (ELECTRICAL REVIEW, October 9th, 1925), one of the principal sources of energy for the Swiss electrified railways. The station utilises the water power of the River Reuss, between Gurtnellen and Amsteg. Provision is made for six 10,000-kW turbine generators, five of which were completed towards the end of last year when the sixth machine was well in hand. The turbines are of the Pelton type, and are served by three steel pressure conduits, each 1,476 ft. long and with a diameter varying from 5.25 ft. at the lower end to 5.9 ft. They are designed to work under a head of 902 ft., with a delivery of 1,045 gallons per second, running at 333⅓ r.p.m. The turbines are direct coupled to Oerlikon alternators.

Fig. 2 shows the Kerstelenbach viaduct, near Amsteg, on the electrified railways of the Swiss Federal Railways, recent reports on which record an economy of 21 per cent. on the former working expenses, and a gain on the rolling stock, in that 79 electric locomotives have easily done the work of 100 steam engines. The C.F.F. is still using 251 steam engines in the unfinished section of the lines, but at the end of last year it already had in the first "Arrondissement" 29 electric locomotives of the "Séchéron" type, 24 of the "Brown, Boveri"

type, and 8 "Séchéron" auto-motors running on single-phase; also 8, including 7 of the "Brown, Boveri" type, for three-phase working.

While the electrification has introduced a new factor of danger for men working on the C.F.F., if one compares the statistics of railway accidents in Switzerland with those of other European countries, one is forced to admit that fewer accidents take place on the Swiss side of the Alps than anywhere else, and that a record of one traveller killed and four hurt per ten million persons carried is very reassuring as to some of the advantages of electric traction and good engineering.

The construction of a power station not far from Einsiedeln, at Etzel, is being considered by the Federal Railways, but this presents a serious difficulty. The barrage to be constructed would confine a formidable mass of water with a surface area of about 3,800 acres, of which about 1,000 would be redeemed from the valley of Wäggi. The creation of this artificial lake would completely destroy a flourishing agricultural district. It appears that 46.7 per cent. of the land is communal property, but the remaining 53.3 per cent. is private, so the question of indemnity looms large in the new scheme.

Telegraph and Telephone Notes.

(*Continued from page 138.*)

Storms in France.—DISORGANISATION OF TELEGRAPH AND TELEPHONE SERVICES.—Some idea of the extent to which the telegraph and telephone services in France were affected by the incessant storms which raged throughout the country from December 20th to December 31st may be gathered from a communication issued by the Ministry of Commerce, Posts and Telegraphs. In all, the total length of wire lines blown down exceeded 30 kilometres, while thousands of telegraph poles were overthrown. The damage was particularly serious in the Paris suburbs; 53 poles supporting 84 wires came down on the railway at Pierrelays; at Herblay 15 poles bearing 50 wires fell on a train, happily without causing any serious accident. Over a kilometre of the important system of 130 wires connecting Lille with Dunkerque was blown down, while over a distance of several kilometres the Paris-Belfort system collapsed near Troyes. Near Saint Quentin the international Paris-Erquelines line was damaged, and over four kilometres the Paris-Brest line was felled to the ground.

The telephone system was badly interfered with; on December 31st only 584 trunk lines out of 1,153 were working; of the main telegraph lines 355 out of 425 were put out of action. Every effort was made to adopt temporary measures to ensure communication, but often repaired lines were blown down again immediately. It took a full fortnight after the last days of the gale to bring the telegraph and telephone systems back to normal.—*Reuter* (Paris).

Radio-telegraphy rendered good service to the ordinary telegraph service during the stormy period. The French station at Saint Assise, during one day recently, transmitted 32,000 words to London and other destinations when the wire lines were hard pressed owing to breakdowns, says the *Daily Telegraph*. The schedule arranged was faithfully adhered to and every message was sent out on time.

Eastern Europe.—NEW WIRELESS SERVICES.—Marconi's Wireless Telegraph Co., Ltd., announces that new radio-telegraph services have been inaugurated between Great Britain and Yugo-Slavia and Bulgaria; messages for those countries should be marked "*via* Marconi," and the rates are as follows:—Yugo-Slavia, urgent 10½d. per word, ordinary 3½d.; Bulgaria, urgent 1s. per word, ordinary 4d.

India.—NEW RADIO STATIONS.—The wireless station which is being erected at Kirkee, near Poona, in the Bombay Presidency, in connection with the Imperial wireless chain, is expected to be ready in six months' time, and to be able to operate at the rate of 1,000 words a minute. There will be five steel masts, each 280 ft. high, in a line pointing directly to the Skegness reciprocal station. The *Daily Telegraph* expects that shortly the station will be enlarged to communicate with Tokio, and also with South Africa. The receiving station at Dhond, 50 miles away, is also progressing.

Latvia.—NEW TELEGRAPH CABLE.—It is reported from Riga that a new telegraph cable is being laid between that city, Dunaberg, and Roistten.

Marine Radio Operators.—STRIKE INQUIRY REFUSED.—About 1,500 ship's radio operators have been on strike for about eight weeks. The Ministry of Labour has refused the application of the Association of Wireless and Cable Telegraphists to hold a court of inquiry.

Sweden.—AUTOMATIC TELEPHONY.—Mr. Lundgren, of the State telephone service in Stockholm, states that the scheme for the introduction of automatic telephony in that city, which is now in progress, aims at the establishment of automatic connections for 12,000 subscribers at the main exchange, and the apparatus is to be delivered in the course of three years in connection with the transfer from the old to the new exchange. In the other exchanges the automatic principle will be applied to a total of 22,000 lines, and the work is to be completed in 1928. It is necessary for the State to introduce the automatic system in Stockholm and Gothenborg for reasons of economy, as the existing expenses with the manual exchanges are too high. After the latter city has been equipped in this manner, the Malmo area will be converted.

The Telephone Service.—RURAL TELEPHONY.—Farmers and the railway companies are co-operating in an interesting scheme. The *Daily Telegraph* explains that the London and North-Eastern Railway Co. conceived the idea of inducing farmers to install telephone lines between their homes and the nearest railway station, and thus keep in constant communication with the market and save considerable time and many ineffective journeys for inquiries. The L.N.E.R. has practically completed its agreement with the Post Office, and it is hoped that the scheme will shortly comprise the whole of the railway systems of the country.

LIVERPOOL DEVELOPMENT.—In the annual report of the Liverpool and District Advisory Committee it is recorded that last year 6,762 telephones were fitted, a net increase (after deducting cessations) of 4,095, or 8 per cent. more than 1924. New exchange premises have been obtained at Hoylake, Huyton, and Upton; a site has been acquired for a new Garston exchange, and building operations are expected to commence very shortly. A site has also been acquired in Limekiln Lane, Liverpool, for a new North exchange; the new building will eventually accommodate one of the automatic exchanges projected for the Liverpool area. In the last 13 years the total underground mileage of telegraph and telephone lines has grown from 99,444 to 194,749. To meet the demand for increased circuits from Liverpool to Manchester a further cable, providing 254 circuits, is to be provided next year. Direct telegraph communication between Liverpool and Antwerp has been definitely authorised, and arrangements are being made for the installation. The restoration of direct communication between Liverpool and Germany is also being considered.

Venezuela.—TELEGRAPH SERVICE.—Reporting to the Department of Overseas Trade on the economic conditions in Venezuela (under date September, 1925), Mr. H. A. Hobson, H.M. Consul at Caracas, mentions improvements that have been effected in the Caracas wireless station, and states that communication with Trinidad has been well maintained; the Maiquetia station has also been in constant touch with Puerto Rico. The Puerto Cabello and Maracaibo stations no longer work, no satisfactory results ever having been obtained from them. The French Cable Company's report shows an increase of some 12,000 telegrams (about 20 per cent.) in 1924 over the 1923 figures. A concession was granted on September 25th, 1924, to a military official in the Telegraph Service to import and sell wireless apparatus and to establish a service of radio concerts. Up to the present, however, no scheme has been formulated and consequently not a single wireless set (except the official experimental ones) has been introduced into Venezuela.

Radio Notes.

Birmingham Station.—NEW STUDIO.—The new studio and office accommodation at 5IT, which was opened on January 20th, gives the station the distinction of possessing the largest studio in the country. The equipment may be said to represent the high-water mark in the development of broadcasting on the transmitting side, for the whole of the apparatus is of the latest type. A point of interest is the adoption of a new method of controlling echo effect in the studio, for the B.B.C. has definitely discarded the belief, so securely held in the early days of broadcasting, that it was necessary to prevent all echo by means of heavy draping in the studio. It is freely recognised now that these conditions do not give the best results, and that a certain amount of echo imparts a pleasing ringing quality to a transmission and enhances the clarity and carrying power alike of music and speech, though the necessary amount of echo in both cases is not the same. Echo must be very carefully regulated and considered in close relationship with the kind of music which is being sent out. In the new Birmingham station the need for variability is provided for by draping, hung as curtains upon a system of pulleys, which will enable the studio director to vary the amount of echo at will.

Broadcast Wave-lengths.—PROBABLE CHANGES.—In connection with the efforts that are being made to reduce inter-station interference, it is understood that Bournemouth is the British station selected to take part in the initial tests, in the course of which its wave-length, at present 386 metres, will be changed at different times to 250, 350, and 500 metres. The foreign stations which will co-operate are *Petit Parisien* (Paris) and those at Berlin and Rome, all of which, says the *Daily Mail*, will broadcast simultaneously on the same wave-length. If the experiments show that the stations can transmit without jamming one another, tests with other groups of stations will be made, and the results will be placed before the International Wireless Conference for drawing up a plan of group wave-lengths.

El Salvador.—NEW STATION.—The Department of Telegraphs and Telephones of the Salvador Government notifies that the new 500-watt broadcasting station erected in the

capital, San Salvador, will be opened for public traffic shortly. The wavelength employed will be between 400 and 500 metres. The demand for radio receivers of the less expensive types shows signs of expansion, and dealers are making larger stock purchases.—*Reuter's Trade Service* (San Salvador).

U.S.A.—WAVE-LENGTH PIRACY.—In connection with the congestion of the ether through the rapid growth of broadcasting, an important step has been taken by the United States Government in ordering proceedings to be instituted against the Zenith Radio Corporation, Chicago, for pirating a wavelength. When the Zenith Co. applied for a licence it was informed that there was no separate wavelength available, and it was only given permission to share a wavelength with a Denver station. Recently the Zenith Co., says the *Daily Telegraph*, commenced broadcasting on a wavelength allotted to Canada, but hitherto unused. The forthcoming action will be the first test of the Government's power to regulate wavelengths.

India.—NEW STATIONS.—Marconi's Wireless Telegraph Co., Ltd., states that broadcasting in India, which, so far, has been carried on only through the efforts of radio clubs in Calcutta, Bombay, Rangoon, and Madras, will shortly be put on a commercial basis by the grant of a licence to the Indian Radio Telegraph Co. It is reported that the broadcasting stations which the company contemplates building at Bombay and Calcutta, as mentioned last week, will each have a power of 12 kW.

Irish Free State.—DUBLIN STATION.—The Staisiun Craoibscaoileachain Ath Cliath, otherwise 2RN, commenced to broadcast on January 1st, 1926, but already, says *The Times*, its adverse critics largely outnumber those who praise its achievements. So far the station has been broadcasting only for two hours every evening, from 8 until 10 o'clock, and there has been no programme at all on Sundays. In view of the fact that a wireless licence in the Free State costs a guinea, purchasers of crystal sets in the Dublin area complain that they are being treated unfairly, more especially as the standard of the 2RN programmes has not been very high. The announcement of the station director that arrangements are being made to give lessons in the Irish language by wireless has not been received with much enthusiasm anywhere.

Patent Royalties.—A WARNING.—Of interest to amateur constructors of broadcast receiving apparatus is the statement which is understood to have been issued by Marconi's Wireless Telegraph Co., Ltd., to the effect that all persons whatever supplying or receiving by way of sale, gift, or exchange, unlicensed broadcast receivers embodying patents controlled by Marconi's Company, are liable to legal proceedings for infringement. By disposing of, or acquiring, such apparatus upon which no royalties have been paid harm is done to the trade, and Marconi's Co. is accordingly only prepared to authorise amateurs to dispose of a broadcast receiver employing its patents on one single occasion, and then only upon payment of the royalty. The Company will then issue the necessary licence-plate for the set. Any person, firm, or company wishing to construct and sell a number of instruments must apply to Marconi's Co., which is prepared to grant licences to *bona-fide* manufacturers in this country.

Regional Stations.—POSSIBLE NEW SHEFFIELD STATION.—It is suggested that Sheffield listeners will probably be amongst the first to try the "regional station" scheme of the B.B.C. Subject to the Postmaster-General's consent, the idea is to build a high-power station some miles north-east of the city, which would be additional to the present relay station (2FN), for the purpose of transmitting two programmes simultaneously. Another similar station may be provided further west too.

Transatlantic Tests.—INTERNATIONAL CO-OPERATION.—For the fourth year in succession transatlantic broadcasting tests are to commence on Sunday night, January 24th-25th. The International Radiophony Bureau at Geneva announces that the broadcasting companies of America will commence the week of trials and continue until the following Saturday. Transmission will be made alternately from both sides of the Atlantic, as the Central European stations, as well as some of our own, have all been allotted special transmitting times. Arrangements have been made to ensure freedom from interruption by stations not transmitting, and the prearranged schedule is in itself an indication of the extent to which international co-operation has been reached. The *Daily Telegraph* regards the inclusion in the scheme of stations in Mexico, Cuba, the Panama Canal zone, and Alaska as a hopeful augury for the future of broadcasting.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—Postmaster-General's Department. March 23rd. Telephone switches.*

March 29th. State Electricity Commission. Transformers and auxiliary apparatus.*

March 8th. City Council. Totally-enclosed armoured type switchgear. Specifications from the City Electrical Engineer's Office, Melbourne.

SYDNEY.—February 10th. New South Wales Government Railways. 100 40-h.p. traction motors; March 3rd, 101 electric car equipments, consisting of motors, control equipments, air compressors, pantographs, &c.; April 14th, one 5-ton fixed electric crane. Forms of tender from Chief Mechanical Engineer, Wilson Street, Redfern, Sydney.

February 17th. 1,500-V, d.c. switchgear for St. Leonards and Hornsby sub-stations; March 3rd, 11,000 V ironclad switchgear for St. Leonards sub-station; March 10th, Stokers or pulverised fuel equipment for three water-tube boilers for White Bay power house. Specifications from Chief Electrical Engineer, 61, Hunter Street, Sydney.

Municipal Council. February 15th. Twenty transformer tanks. February 8th. L.p. cables. Specifications from the Construction Engineer, Electricity Department, Town Hall, Sydney.

March 2nd. Australian Gas Light Co. One 750-kW turbo-generating set. Specifications from the Engineer, Parker Street, Haymarket, Sydney.

Aylesbury.—February 16th. Electricity Department. Overhead 11,000-V transmission lines and cables. (See this issue.)

Bath. — January 29th. Electricity Department. One 6,000-kW turbo-alternator, one water-tube boiler, mechanical stoker and economiser, and one 1,000-kVA transformer. (January 15th.)

Balearic Islands.—Plant, &c., required in connection with the electrification of the Majorca railway. Particulars from the Campañia de los Ferro-Carriles de Mallorca, Palma de Mallorca, Balearic Islands.—*Reuter's Trade Service* (Madrid).

Clitheroe.—February 23rd. Corporation. Transformers, switchgear, and cable connection for sub-station; e.h.p. and l.p. cables, boxes, &c. (January 15th.)

Edinburgh.—January 25th. Tramways Department. 25 air brakes suitable for electric tramway cars. Specifications from manager.

Glasgow.—January 25th. Corporation. Electric lighting installation in connection with Stockwell Street improvement; new buildings in Trongate. Specifications from Office of Public Works, City Chambers.

Grimsby. — January 30th. Electricity Department. 500-kW traction converting plant, sub-station e.h.p. switchgear, e.h.p. feeder and pilot cables. (January 15th.)

Halifax.—February 20th. Markets and Parks Committee. Electrical engineering work in connection with the erection of the public abattoirs. Particulars from Borough Engineer, Crossley Street.

India.—March 8th. India Store Department. 40 electric freight locomotives in connection with the G. I. P. Railway electrification. (January 15th.)

February 5th. Punkah motors, a.c.

Kilmarnock. — Ayrshire Electricity Board. Supply, delivery and laying of h.p. cables and ducts in the Burghs of Ayr and Prestwick, also transformer kiosks and section pillars. (See this issue.)

Leeds.—February 1st. Board of Guardians. Supplying and laying underground l.p. cables at the Institution, Beckett Street. (See this issue.)

Liverpool.—January 28th. Electricity Department. Twelve months' supply of cables, meters, electrical sundries, electric lamps, &c. (January 15th.)

London.—E.C.—January 30th. Marryat & Place. 113,000 5-amp., 220-V tumbler switches. (January 8th.)

HAMMERSMITH.—February 10th. Electricity Department. Stores for 12 months, including electric light sundries, insulated wire, joint boxes, meters, l.p. cables, &c. (See this issue.)

ISLINGTON.—January 28th. St. Mary's Board of Guardians. Installation of electric lighting at Andover Row Schools. (January 15th.)

February 8th. Electricity Department. One 10,000-kW 3-phase turbo-alternator, condensing plant, condensate, circulating exhaust, steam and water pipes, &c. (See this issue.)

METROPOLITAN WATER BOARD.—February 8th. 12 months' supply of electric lamps. Forms of tender from the Chief Engineer, 173, Rosebery Avenue, E.C.1.

LONDON COUNTY COUNCIL.—January 25th. 4,425 tons of standard steel girder tramway track rails, fishplates and fishbolts, and about 600 tons of conductor rails. Specifications from the Chief Engineer, Old County Hall, Spring Gardens, S.W.

February 22nd. H.p. switchgear for Lewisham tramway sub-station. (See this issue.)

Manchester.—January 26th. Tramways Committee. Motors and trucks for electric tramcars. Specifications from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly.

January 29th. Electricity Committee. Wiring for electric lighting and power circuits, offices, stores and workshops at the High Street depôt, Chorlton-on-Medlock. Specification from Mr. H. C. Lamb, manager, Electricity Department, Town Hall.

Newark-upon-Trent.—February 10th. Electricity Department. E.h.p., medium, and l.p. mains and distribution network, with street-lighting mains and accessories, single- and three-phase house-service pattern meters, two 250-kVA transformers, e.h.p., 11,000-V switchgear. (See this issue.)

New Zealand.—WELLINGTON.—March 8th. New Zealand Government Railways. Two 25-h.p. variable-speed motors, one 125-kW motor-generator set and 17 400-V, 3-pole switches.*

Public Works Department. April 6th. Storage battery, motor generator, and switchboard for the Penrose sub-station.

March 23rd. Five oil filters, 5 oil-testing equipments, and 5 filter-paper drying ovens.* 22,000-V switchgear and equipment for Penrose sub-station.*

Plymouth. — February 4th. Electricity Department. One 6,000-kW turbo-alternator, condenser, &c.; one 350-kW converter. (January 15th.)

Retford.—February 19th. East Retford Gas, Water and Electricity Department. Electricity generating plant, mains, transformers and meters. (See this issue.)

South Africa.—JOHANNESBURG.—February 25th. Municipal Council. Four d.c. switchgear panels and 3-phase truck-type ironclad switchgear panels.*

February 25th. S.A. Railways and Harbours. Two 4-ton electrically-driven fixed wharf cranes for Luderitz jetty.*

Tenterden (Kent).—January 27th. Board of Guardians. Electric lighting installation at the Institution. Master of the Institution.

Uruguay.—MONTEVIDEO.—February 26th. State Electricity Works. Diesel oil engine and a direct-coupled generator.*

Walthamstow.—January 27th. U.D.C. Electricity Department. Two water-tube boilers, mechanical stokers, economisers and pipework, &c. (January 8th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Belgium.—The Belgian Post and Telegraph Department has placed an order with the Ateliers de Constructions Electriques de Charleroi for the manufacture, laying and jointing of 350 kilometres (about 218 miles) of special long-distance telephone cable for connecting Brussels with La Panne, Lille and Roosendaal, at a total cost of a little over £600,000.

Billericay.—Board of Guardians. Accepted:—
Electrical equipment of the Institution and the new hospital (£3,775).—Ellis & Ward.

Birkenhead.—Electricity Committee. Accepted:—
Six miles v.i.r. cable (£1,068).—Callender's Cable & Construction Co., Ltd.
Three miles single core cable (£1,057).—Macintosh Cable Co., Ltd.

Carlisle.—Electricity Committee. Accepted:—
Supplementary pipework at new generating station (£291).—Stirling Boiler Co., Ltd.

East Ham.—Electric Lighting Committee. Recommended:—
Transformer plant (£416).—Fuller's Electrical & Manufacturing Co.

Gravesend.—Electricity Committee. Recommended:—
Conveying plant alteration (£276), plus 2s. 9d. per hour for erectors' services.—Bennis & Co., Ltd.

Halifax.—
Electric vacuum plant for Town Hall cleaning purposes (£489).—Sturtevant Engineering Co., Ltd.

Irish Free State.—DUBLIN.—Dublin City Commissioners. Accepted:—
Electric wiring of 422 houses at Croydon Park area (£5,417, £12 16s. 9d. per house) with Continental wire.—Dublin Corporation Electricity Department.

Lamp Contracts.—The British Thomson-Houston Co., Ltd., has received a twelve-months' contract for the supply of "Mazda" lamps to the Great Southern Railway Co. (Ireland).

London. — ISLINGTON. — Electricity Committee. Recommended:—
Switchgear (£17,925).—Park Royal Engineering Works, Ltd.
3-phase transformers and regulators (£10,834).—C. A. Parsons & Co., Ltd.
75-kW motor-generator (£2,087).—Electric Construction Co., Ltd.

HAMMERSMITH.—Works, Cartage and Cemetery Committee. Accepted:—
Renewal of batteries for two electric dust vehicles, £182 each, less £27 each for old batteries returned.—Chloride Electrical Storage Co., Ltd.

Oldham.—Electricity Committee. Accepted:—
Cable.—Union Cable Co., Ltd.
A.c. recording voltmeters.—Erskine, Heap & Co., Ltd.
Supply and erection of superheaters at new generating station.—Babcock and Wilcox, Ltd.

South Shields.—Housing Committee. Accepted:—
Wiring Council houses (£6 12s. per non-parlour house, £7 5s. per parlour house).—Embleton & Barker.

Stafford.—Electricity Committee. Accepted:—
Cable in connection with the second 3,000-kW set (£550).—Callender's Cable & Construction Co., Ltd.

Weymouth.—Housing Committee. Accepted:—
Wiring houses on Westham housing estate (£280).—B. P. Darch.

Forthcoming Events.

Royal Institution.—Friday, January 22nd. At 21, Albemarle Street, W. At 9 p.m. Lecture on "The Work of the Davy-Faraday Research Laboratory," by Sir William Bragg.

Institution of Production Engineers.—Friday, January 22nd. At the Society of Motor Manufacturers, Ltd., 83, Pall Mall, S.W. At 7.30 p.m. Paper on "Features of Machine Tools which make for Increased Production," by Mr. G. W. Rawlings.

Physical Society of London.—Friday, January 22nd. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

Birmingham Electric Club.—Friday, January 22nd. At the Grand Hotel, Colmore Row. At 7 p.m. Presidential address.

Institution of Electrical Engineers.—Monday, January 25th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Informal meeting. Discussion on "Impressions of My Visit to America, mainly about Switchgear," to be opened by Mr. H. M. Clothier.

(Mersey and North Wales (Liverpool) Centre).—Friday, January 29th. At the University Club, Liverpool. Annual dinner.

(North-Eastern Centre).—Monday, January 25th. At the Armstrong College, Newcastle-on-Tyne. At 7 p.m. Paper on "The Past, Present, and Future Developments of Wireless Telephony," by Capt. P. P. Eckersley.

(North-Midland Centre).—Tuesday, January 26th. At the Hotel Metropole, Leeds. At 7 p.m. Paper on "The Use of Induction Regulators in Feeder Circuits," by Mr. L. H. A. Carr.

(North-Western Centre).—Tuesday, January 26th. At the Midland Hotel, Manchester. Annual dinner.

(South-Midland Centre).—Wednesday, January 27th. At the University, Birmingham. At 7 p.m. Paper on "The Power Losses in Magnetic Sheet Material at High Flux Densities," by Mr. C. E. Webb.

(Western Centre).—Tuesday, January 26th. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Faraday Lecture on "Illumination and Light," by Mr. A. P. Trotter.

(London Students' Section).—Friday, January 22nd. At the Institution, Victoria Embankment. At 6.15 p.m. Paper on "Switchgear," by Mr. C. F. George.

(Scottish Students' Section).—Friday, January 22nd. At the Royal Technical College, Glasgow. At 7.30 p.m. Paper on "Economics and Engineering," by Mr. W. S. Cormack.

Institution of Civil Engineers.—Tuesday, January 26th. At Great George Street, S.W. At 6 p.m. Paper on "The Rugby Radio Station," by Mr. A. S. Angwin and Mr. T. Walmsley.

Electricity Supply Commercial Association (Greater London Division).—Tuesday, January 26th. At the Cannon Street Hotel. From 7.45 p.m. to 11.30 p.m. Dance.

Electrical Power Engineers' Association (Derby and District Section).—Wednesday, January 27th. At the Black Boy Hotel, Long Row, Nottingham. At 7 p.m. Lecture on "Boiler Plant Development in Association with Powdered Fuel," by Mr. F. H. Rosencrants.

Batti-Wallahs' Society.—Wednesday, January 27th. At the Hotel Cecil, Strand, W.C. At 1 p.m. Luncheon. Address by Sir Hugo Hirst, Bart.

Junior Institution of Engineers.—Friday, January 29th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "Comfort in Railway Travel from the point of view of the Engineer," by Mr. A. N. Moon.

Institution of Welding Engineers.—Friday, January 29th. At the Philosophical Hall, Park Row, Leeds. At 7 p.m. Paper on "The Arc Welding of Seams in Steel Plates," by Mr. J. T. Carr.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

CONVENIENT table standards.
WHIRLPOOL electric heaters.
YAVAN flexible cementing material.
COOLEX fuse boards.

Notes.

Bay of Fundy Hydro-Electric Scheme.—Some particulars are given in the *Electrical News* of a proposed scheme for the development of the tides of the Bay of Fundy for hydro-electric purposes. Two smaller bays, Passamaquoddy and Cobscook, are separated from the main portion by a number of islands. The suggestion is to generate power by keeping the two pools at separate elevations by means of a number of dams connecting the various islands, and allowing the ocean water to flow from the upper pool through a power house to the lower one. The level of the upper pool would be raised at each high tide by opening control gates at that time and that of the lower pool lowered at each ebb tide. There is a neutral phase when the tides would have no action on the pools and during this period the source of power would be from storages. As the fall between the pools was lessened the number of turbines in service would be increased. The storage area would be 150 square miles. It is estimated that the cost of the scheme would be $85,000,000, and that an average of 500,000 h.p. could be generated while the annual production would be about 3,000,000,000 kWh.

Fatality.—At an inquiry into the death of John W. Green, an electrical engineer employed by the Newcastle-on-Tyne Electric Supply Co., Ltd., at the Castner-Kellner sub-station at Wallsend, it was found that the deceased had died from burns accidentally received from an electric arc. This, the verdict stated, had been set up by his having opened feeder isolator bars, apparently not knowing, or having overlooked, that the pressure was on. Whether the deceased had had some temporary aberration or pre-occupation at the time, or had not been given a definite and correct message by the control engineer as to the position generally, the jury was unable to say.

Tramways and Light Railways Association.—The seventeenth annual congress of the Association will be held at Bristol on June 24th and 25th, 1926.

South African Association of Municipal Electrical Engineers.—The next convention of the Association, says the *South African Engineer*, is to take place in Johannesburg during the week April 12th to 17th next. Mr. B. Sankey, general manager of the gas and electricity undertaking of the Johannesburg municipality, is the president-elect, and it is anticipated that there will be a large gathering of municipal electrical engineers, together with their councillor delegates, from all over the Union.

The Government's Electricity Scheme.—Representatives of the electricity supply industry met on January 19th to discuss the Government's electricity scheme. No official statement in connection with the conference was issued, but the *Financial Times* states that the electrical manufacturers and supply authorities who have been consulted by the Ministry of Transport on certain details have few modifications to suggest, and are definitely in favour of the new legislation, not so much for the technical changes and improvements it will effect as for the prospects it offers of creating a sound home market for their products. The Government has no intention of embarking through the medium of a Power Board on immediate large capital expenditure, and investors who see in the new proposals an opportunity for immediately increased activity in the electrical manufacturing industry are certain to be disappointed. On the other hand, the removal of legislative obstruction will justify existing undertakings in embarking at once on constructive schemes. The benefit to the manufacturer will accrue from the increased activity of existing undertakings, rather than from the provision of capital stations owned by the central authority. The progressive supply authority, whether municipal or industrial power company, will benefit directly, since power as sold by it to the large industrial consumer is as cheap as any national system of power stations and main transmission lines could devise. The Board will deal with policy almost exclusively and the principal factors in administration, while the Electricity Commission will work out the technical, engineering and financial details. It is obvious that the new scheme depends wholly for success on this Board, and if it is unequal to the task, electrical development may be retarded, or even diverted into the wrong channels.

E.P.E.A. Peterborough Dispute.—The protracted negotiations between the Peterborough Corporation and the Electrical Power Engineers' Association have been settled. Following the Association's threat to withdraw its members' services, *The Times* reports that the Town Council has decided to reclassify the electricity undertaking into Class C and to pay the technical staff's salaries increases retrospectively from November, 1924.

Electricity Supply in Canada in 1924.—A preliminary report on the electricity generating station industry in Canada, published by the Dominion Bureau of Statistics, shows that a substantial increase took place during 1924. There was no change in the number of power plants, but transmission and distribution lines were extended in every province and service was supplied to 1,219 municipalities as against 1,146 in 1923. Many additions were made to existing power plants, especially in the hydraulic stations. Water wheels increased by 26 in number and by 425,410 h.p. in capacity; steam turbines and internal combustion engines also increased in both number and capacity, but reciprocating engines showed reductions, the net increase in primary power main plant equipment being 425,605 h.p. and in auxiliary equipment, 18,530 h.p. The increase in capital during the year was 8 per cent. Capital invested in hydraulic stations increased from $464,171,935 in 1923 to $507,116,143, or by 9 per cent., whereas the investment in fuel stations showed a slight decrease. Some of the larger additions made during the year were 120,000 h.p. by the St. Maurice Power Company, 22,600 h.p. by the Montreal Light, Heat and Power Company, 20,000 h.p. by the Quinze Power Company in Quebec, 136,000 h.p. in the Niagara plants, 6,600 h.p. in the Central Ontario system and 25,000 h.p. in the Cameron Falls plant of the Ontario Hydro-Electric Power Commission, and 12,500 h.p. by the Canadian Niagara Power Company in Ontario. In Manitoba, the Manitoba Power Company put into operation 56,000 h.p. and in British Columbia the East Kootenay Power Company added 15,000 h.p. to its Fernie plant. The net revenue of generating stations during the year showed an increase of $7,119,970, or 10.5 per cent. The number of customers also increased in all provinces. The increase in Quebec was 24,671, or 8.3 per cent.; in Ontario, 33,195, or 7 per cent., and in Manitoba, while the increase was not so large (16,760), it was at the rate of 22 per cent. The output was less than during 1923 in Nova Scotia, Saskatchewan, Alberta and in the Yukon, but the increases of 898,408,000 kWh in Quebec, 167,296,000 kWh in Ontario, 124,056,000 kWh in Manitoba, and 30,849,000 kWh in British Columbia, with smaller increases in the other provinces, produced a net increase of 1,216,089,000 kWh, or 15 per cent. The total output of fuel stations was less by 8,695,000 kWh, or 5.5 per cent., decreases being shown in all the provinces except Prince Edward Island, Ontario and British Columbia, where only small increases were made. The hydro-electric stations increased their production in every province. Although the fuel power plants are almost as numerous as the hydraulic plants, they play only a minor part in industry, generally as lighting plants in small municipalities, and their output was only 5 per cent. of the total.

National Research Endowment in the United States.—An official announcement quoted in *Science* states that the National Academy of Sciences has appealed to a body of prominent public men to join with leading scientists in an endeavour to secure larger resources for research in pure science. It is hoped that an annual income of at least two million dollars will be secured to establish National Reearch Professorships, and in other ways to co-operate with universities and other institutions throughout the country which are prepared to do their full share in the encouragement and support of fundamental research in the mathematical, physical and biological sciences. While the United States is in the forefront of industrial research, it is accomplishing much less in pure science than its population and material resources would lead one to expect.

The Academy has created a special board of trustees of the National Research Endowment. Mr. Herbert Hoover has been requested to act as chairman of the board and has accepted.

In discussing the vital need for greater financial support of pure science research, Mr. Hoover said in a recent address: "While we have in recent years developed our industrial research upon a scale hitherto unparalleled in history, we have by no means kept pace in the development of research in pure science. The sudden growth of industrial research laboratories has in itself endangered pure science research by drafting the personnel of pure science into their ranks. Thus applied science itself will dry up unless we maintain the sources of pure science. We must add to knowledge, both for the intellectual and spiritual satisfaction that comes from widening the range of human understanding, and for the direct practical utilisation of these fundamental discoveries. A special study in an industrial laboratory, resulting in the improvement of some machine or process, is of great value to the world. But the discovery of a law of Nature, applicable in thousands of instances and forming a permanent and ever available addition to knowledge, is a far greater advance."

Officials of the academy explain that the problem is to make academic posts so attractive that the ablest men will seek and hold them permanently because of the opportunties they offer to advance knowledge by fundamental research. This can be done by providing adequate salaries, freedom from too much teaching or administration, necessary instruments and apparatus, and skilled assistants to perform the extensive routine operations that scientific research involves. In short, able investigators should be given some such comfort in life, freedom of action, and opportunity for constructive thought as industrial and administrative officers, certainly of no larger calibre, habitually enjoy.

Appointments Vacant.—Relief engineer (£282), switchboard attendant (£282), three junior switchboard attendants (£245 and £195), three junior sub-station attendants (£165) for the Dublin Corporation Electricity Department. Shift charge engineer for the Borough of Warrington Electricity Department. Technical assistants in the Torpedos and Mining Department of the Admiralty (£400+). Electrical clerk of the works at Barking power station, for the County of London Electricity Supply Co., Ltd. Power station superintendent (£952), two charge engineers (£630) for the Municipal Commissioners of Singapore. (See our advertisement pages to-day.)

High-pressure Transmission in Germany.—This problem was discussed by various engineers at a conference of the Electrotechnical Association for the industrial region of Rhenish-Westphalia, held at Essen this month. Herr Weickert, of the Mannheim firm of Brown, Boveri & Co., dealing with high-pressure switching installations, stated that until a few years ago only a few main transmission lines in Germany were operated at 100,000 volts, whereas now the country was covered with a network of 100,000-volt lines, while the Rhenish-Westphalian Electricity Works Co. was constructing the first line at 220,000 volts, which was being erected in the direction of South Germany. It was held that a pressure of 380,000 volts would have to be employed if large power was to be transmitted across Germany. The electrical manufacturing industry in itself, he remarked, was prepared for such a high pressure, but it was a matter for the supply industry to investigate whether such a pressure could be economically employed in Germany. Discussing the question of high-pressure overhead insulators, Dr. Binder, of the Dresden Technical High School, stated that it was of special importance for the insulators to hold good not only in dry weather, but also under the many unfavourable working conditions represented by rain, snow, fog, and thunderstorms. At present insulator chains were used for the suspension and staying of the conductors in connection with the high pressures employed, consisting of an average of six links in the case of 100,000 volts. If in future recourse was had to the use of 220,000 volts as the working pressure, as was required by the great increase in the energy requirements, the result would be the employment of insulator chains of 12 links at the least and a length of over 2½ metres. But as a result of the employment of wire guards or protection trays at the end of the chain, it had been possible to bring about almost a uniform distribution of the pressure and divert arcs from the chain. In conclusion, the professor remarked that it was possible to look forward with complete confidence to the development of installations at 220,000 volts, seeing that one German firm stated that its latest tramway insulators had a breaking strain of 18 tons.

B.E.S.A. Publication.—The British Engineering Standards Association has just issued a glossary of terms used in illumination and photometry which it has prepared for the assistance of all interested in the subject. The terms have been approved by the National Illumination Committee of

Great Britain and are in accordance with the decisions of the International Illumination Commission so far as such decisions are applicable. The glossary covers a wide range of terms and where there are two terms in use for the same definition, the preferred term is given in heavy type and the synonym in lighter type. Copies of the new publication, No. 233—1925, can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

Engineering Conference in Australia.—The Engineering Conference which was to have been held at the beginning of 1925, is now to take place at Hobart from February 15th to 19th, 1926. An interesting programme has been arranged and in addition to social functions, visits to works and places of interest, &c., the following will be amongst the papers that will be presented during the conference: "Notes on the Development of the Power Resources of Tasmania," by J. H. Butters; "The Commercial Use of Electric Vehicles," by H. A. Child; and "The Construction of a Multiple Arch Dam at Miena," by A. H. Bastow.

The Rural Reconstruction Committee.—A conference has been arranged by the Rural Reconstruction Committee to take place at Denison House, Vauxhall Bridge Road, S.W.1, on January 23rd, to consider what steps should be taken to place its policy before the nation. The chair will be taken by Dr. Gilbert Slater, and the conference will be opened by Mr. Montague Fordham, who will deal with the agricultural problem. Mr. R. Borlase Matthews will deal with the question from the point of view of the applications of electricity to agriculture and rural industries. It is interesting to note that the promoters of this movement realise the importance of an electrical supply in the carrying out of any scheme intended to divert dwellers in towns to rural areas and to prevent the depopulation of the countryside.

Engineer Officers in the Navy.—The First Lord of the Admiralty last week granted an interview to representatives of the engineering institutions, who lodged a protest against the recent Admiralty Fleet Order affecting the status of engineer officers in the Navy. The bodies represented were: The Institutions of Civil, Mechanical, and Electrical Engineers, Naval Architects, and the North-East Coast Institution of Engineers and Shipbuilders, representing an aggregate membership of about 36,000 professional engineers.

Institution Notes.

Institution of Electrical Engineers.—PROGRAMME.—The arrangements for the second half of the session include papers by Messrs. E. V. Clark, on "Power Factor and Tariff," and E. W. Dorey, on "Power Factor Improvement" (February 4th); M. Parodi, on "The Electrification of the Paris-Orleans Railway" (February 18th); R. B. Matthews on "Electro-farming" (March 4th); and L. C. Grant, on "Developments in High-Power Fuses" (March 18th). The annual dinner will be held on February 11th, and the 17th Kelvin lecture will be delivered by Sir J. J. Thomson, O.M., F.R.S., on "The Mechanics of the Electric Field," on April 22nd.

WIRELESS SECTION.—On February 3rd Mr. J. Hollingworth will read a paper on "The Propagation of Electric Waves"; on March 3rd, Mr. R. A. Watson Watt will deal with "The Directional Recording of Atmospherics"; and on April 14th, Mr. E. H. Shaughnessy, O.B.E., will describe "The Rugby Radio Telegraphy Station."

INFORMAL MEETINGS.—Discussions will be opened by the following members: Mr. H. W. Clothier, on "A Visit to America—Mainly about Switchgear" (January 25th); Mr. R. J. Mitchell, on "Ball and Roller Bearings" (February 8th); Mr. A. F. Harmer, on "The Application of Electricity to Public Supply" (February 22nd); Mr. F. Creedy, on "A Recent Development in A.C. Apparatus" (March 8th); Mr. G. Rogers, on "The Performance of Mercury-arc Rectifiers" (March 22nd); and Captain P. P. Eckersley, on "Linking together Wireless and Wire Communication Systems" (April 12th).

At the informal meeting which was held at University College, Gower Street, on Monday, January 11th, Mr. W. C. Clinton, B.Sc., supported by Mr. A. G. Hilling as chairman, opened a discussion on "The Electrical Equipment at the Rockefeller Building," which houses the Department of Anatomy, &c., and the Research Laboratories. The installation of electric lighting and power for which a supply is taken from the St. Pancras Borough Council's mains at 220 and 440 volts d.c., is not particularly notable, except for thoroughness and a prolific use of two-way switching, but much of the laboratory apparatus excited very great interest. In the Main Lecture Theatre Mr. Clinton read his paper describing the installation, and detailed with numerous schedules of efficiencies the items of lighting and power equipment. His tables of figures were thrown on a screen by means of the Epidiascope, which projects in natural colours images of prints, books, or any object not too large to be placed in the reflection chamber. The audience then made a tour of the building to inspect the various equipments, which were described by specialists in attendance. On re-assembling in the Lecture Theatre, tributes and minor criticisms were made by Messrs. G. C. Allingham, J. R. Bedford, H. Freeman, A. G. Hilling, C. Lipman, W. E. Rogers, and H. T. Young.

NORTH-WESTERN CENTRE.—Papers will be read on the following dates: February 2nd, by Messrs. E. V. Clark and E. W. Dorey; February 16th, Mr. E. H. Shaughnessy; March 2nd, Messrs. J. L. Thompson and H. Walmsley; March 16th, Mr. L. C. Grant; March 30th, Mr. R. B. Matthews.

WESTERN CENTRE.—Papers will be read on the following dates: January 26th, by Mr. A. P. Trotter (Faraday Lecture); February 1st; March 1st, Mr. T. Carter; April 12th, Mr. R. B. Matthews; May 3rd, Prof. S. Parker Smith.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

Readers of the ELECTRICAL REVIEW will learn with regret that Mr. LEONARD G. TATE, secretary of the Electrical Contractors' Association, has to undergo an operation to-morrow (Saturday). He has been unwell for some time, and was unable to be present at the annual dinner of the Association on Tuesday last. Mr. Tate will have the best wishes of a host of friends in the electrical world for a speedy recovery to perfect health.

Sir MAX MUSPRATT, Bart, J.P., the president-elect of the F.B.I. in succession to Col. F. V. Willey, is one of the leading figures in the chemical industry and chairman of the United Alkali Co., Ltd. He was born in Liverpool in 1872 and was educated at Clifton College and at Zurich, entering in 1895 the works of the company of which he is now chairman. In 1901 he became a director on the technical side of the business and succeeded his father in the chairmanship in 1914. Sir Max is not only well known as a business man in the chemical world; he is also himself a chemist of great ability

Lafayette] *[London,*

Sir Max Muspratt, Bart., J.P.,
The President-Elect of the F.B.I.

and is the first Englishman to hold the Diploma in Industrial Chemistry awarded by the Swiss Government. In addition to the chairmanship of his own business, he is the vice-president of the Association of British Chemical Manufacturers; deputy chairman of the Sulphuric Acid Association; chairman of the recently-appointed Lord Mayor of Liverpool's Committee on Trade and Industry of the Port of Liverpool; and chairman of the Liverpool Economic League. He has taken a very active part in politics and was Liberal M.P. for the Exchange Division of Liverpool in 1910. In 1917 he was Lord Mayor of Liverpool, and since entering the City Council in 1903 has been at one time or another connected with almost every municipal activity in that city.

Mr. W. J. PARKER, chief storekeeper of the Raw Stores at the Marconi Company's works at Chelmsford, who is leaving after 26 years' service, has been presented by the staff with an inscribed gold watch.

Mr. H. STONE, of the Urban Electric Supply Co., Dartmouth, has taken up the appointment of assistant electrical engineer to the Lyme Regis Borough Council.

Mr. A. L. C. FELL, who retired from the position of general manager of the London County Council Tramways last year, is to marry Miss FLORENCE WYNN, of Redcar, next month.

SIR CHARLES BRIGHT, F.R.S.E., &c., has accepted the presidency, and SIR WILLIAM S. GLYN-JONES the vice-presidency, of the Wireless Retailers' Association.

Fulham Borough Council Electricity Committee recommends that the borough electrical engineer, Mr. ARTHUR J. FULLER, be granted three months' leave of absence from duty on full pay, to enable him to recuperate and regain his normal health, and that he be paid a sum of £250 as an honorarium towards the expenses of his enforced holiday, and as a mark of the Council's appreciation of the special services rendered by him to the Fulham electricity undertaking in connection with capital extensions, and otherwise, for many years past.

Bacup Town Council has increased the salary of the borough electrical engineer from £500 to £550 per annum.

Mr. P. V. HUNTER, who contributes an article which appears elsewhere in this issue, is the chairman of the Executive Committee of the National Register of Electrical Installation Contractors and is joint manager of Callender's Cable & Construction Co., Ltd. He was born in Norfolk in 1883 and was a student at Faraday House, after which he became associated with Messrs. Willans & Robinson, the Great Yarmouth Electricity and Tramways Department, and the Willesden Urban District Council. In 1903 he joined the consulting engineering firm of Messrs. Robert Hammond & Son as assistant engineer, and from 1904 to 1916 he was with Messrs. Merz & McLellan, being appointed chief of their electrical department in 1909. While he was with this firm he was associated with the building of the Carville and other important power stations and with the electrification of railways in Argentina and elsewhere. During 1916 and 1917 he was engaged in consultative work in connection with the electrical equipment of the armies in the field, and from December, 1917, until the end of the war he was attached to the naval staff as chief engineer to the experimental and research section of the Anti-Submarine Division. For his war services he was awarded the C.B.E. A full member of the Institution of Electrical Engineers, Mr.

Elliott & Fry] *[London.*

Mr. P. V. Hunter, C.B.E.,
Chairman of the Executive Committee of the N.R.E.I.C.

Hunter is a member of its Council and a past chairman of the North-Eastern Centre. He has been an active member of various committees of the British Engineering Standards Association, the British Electrical and Allied Industries Research Association, and the International Electro-technical Commission. He invented the split conductor protective system, the repellent arc switch in which the repelling effect of two arcs, which are electrically in series but physically in parallel, is employed to increase the rupturing capacity of the switch, and the four-conductor system of three-phase cable protection. During the autumn of last year Mr. Hunter visited America principally in connection with the establishment of the Okonite-Callender Cable Co., a company which, as the name indicates, has been jointly formed by Callender's Cable and Construction Co. and the Okonite Co. of America. The joint company has established a factory at Paterson, New Jersey, for the manufacture of paper-insulated cables, and particularly for exploiting in the United States the special methods which Callender's have developed of manufacturing extra-high-pressure cables.

Mr. J. PICTON BAGGE, British Commercial Secretary at Brussels, is to attend at the Department of Overseas Trade from to-day (Friday) to January 29th. United Kingdom manufacturers and merchants interested in trade with Belgium can obtain interviews by appointment, quoting reference 16,056.

When the British Empire Producers' Organisation meets at luncheon at the Mansion House on February 3rd to celebrate its tenth anniversary, it will present the Rt. Hon. L. S. AMERY, M.P., Secretary of State for Dominion Affairs and the Colonies, with his portrait painted by Sir Luke Fildes, K.C.V.O., R.A.

Mr. J. T. WHITELAW, district manager of the Post Office telephones in the Blackburn area, has been appointed to a similar position at Manchester. He entered the telephone service in 1893.

The Kingston-on-Thames Town Council is recommended to increase the salary of the borough electrical engineer (Mr. KINGHAM) by £150 a year.

The *Daily Telegraph* correspondent at Sydney understands that Mr. PERCY HUNTER has definitely accepted the offer of the general managership of the Pacific Cable Board, which is subject to ratification at the next meeting of the board.

Obituary.—MR. A. L. COTTAM.—The death occurred on January 5th, at Redland, at the age of 71 years, of Mr. Arthur Lawrence Cottam, who carried on business as an electrical and engineering merchant and factor at Bristol. Among those present at the funeral on January 9th were representatives of a number of well-known electrical concerns (Messrs. Johnson & Phillips, Ltd., Callender's Cable & Construction Co., Ltd., the British Thomson-Houston Co., Ltd., Philips' Lamps, Ltd., Swedish General Electric, Ltd., and Messrs. Drake & Gorham Wholesale, Ltd.) and Mr. A. H. Dawson, chief electrical engineer to Messrs. W. D. & H. O. Wills, Ltd.

MR. G. D. ATKIN.—We regret to record that Mr. George Duckworth Atkin, a highly-esteemed member of the Stock Exchange who had for many years been prominently connected with the Electric Lighting share market, passed away suddenly on arrival at his office in Drapers' Gardens, E.C., on the severely cold morning of January 14th. Mr. Atkin, who was 66 years of age, was, through his firm, the issuer of the *Atkins Manual*, which is devoted to electricity supply securities, and has been occasionally mentioned in our "Stocks and Shares" article.

VISCOUNT CHILSTON.—The death has occurred, in his 75th year, of Viscount Chilston, of Chilston Park, Maidstone. He was chairman of the Midland Counties Electric Supply Co., Ltd., and of the Tramways, Light and Power Co., Ltd., a director of the South-Eastern & Chatham Construction and Power Co., Ltd., and a vice-president of the Tramways and Light Railways Association.

Will.—The late Mr. WILLIAM BAYLISS, chairman of Bayliss, Jones & Bayliss, left £68,310 gross and £54,320 net personalty.

New Companies Registered.

Modern Radio, Ltd. (211,082).—Private company. Registered January 13th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers, importers, exporters, and repairers of, agents for, and dealers in instruments, apparatus, and materials capable of being used in connection with radio telegraphy and telephony, in particular cables, wires, rope or other substances, accumulators, batteries, detectors, tuning switches, induction coils, condensers, headphones, thermionic valves, valve panels and receivers, amplifiers, aerial and other insulators, &c. The provisional directors are:—H. R. Smallwood, "Annacur," Gateshead, wireless engineer; R. H. Smallwood, "Annacur," Gateshead, general medical practitioner. Solicitor: C. F. Bolam, 12, West Street, Gateshead.

Bennett & Fountain, Ltd. (211,071).—Private company. Registered January 13th. Capital, £3,000 in £1 shares. Objects:—To acquire the business of wholesale, electrical and wireless suppliers now carried on by E. T. Fountain and A. E. Bennett at 6, Mortimer Street, W.1, as "Bennett & Fountain." The permanent directors are:—A. E. Bennett, 21b, Belmont Park, S.E.13; E. T. Fountain, 172, Willifield Way, Golder's Green, N.W.11. Qualification, 10 shares. Secretary: A. H. Wilson. Registered office: 6, Mortimer Street, W.1.

Strand & Interchangeable Signs, Ltd. (211,066).—Private company. Registered January 13th. Capital, £2,500 in 2,000 ordinary shares of £1 and 2,000 founders' shares of 5s. Objects:—To acquire and take over as going concerns (a) the goodwill of that part of the business of the Strand Electric and Engineering Co., Ltd., which relates to electric signs, and (b) the goodwill of the whole of the business of Interchangeable Electric Signs, Ltd. The directors are:—G. Harvey, M.P., J.P., 176, Cromwell Road, S.W.5 (chairman of Connaught Rooms, Ltd., and Burlington Hotels, Ltd.); A. T. Earnshaw, 50, Verdant Lane, Hither Green, S.E.6, electrical engineer; P. G. A. Harvey, 16, Rosary Gardens, S.W.7, underwriting member of Lloyds (director of Connaught Rooms, Ltd.); M. Mansell, 41, Morley Road, East Twickenham, electrical engineer; P. Sheridan, 151, Culverley Road, Catford, S.E.6, electrical engineer (all permanent). Secretary: H. W. Myers. Registered office: 24, Floral Street, W.C.2.

Bath Electrics, Ltd. (211,070).—Private company. Registered January 13th. Capital, £750 in £1 shares. Objects:—To carry on the business of factors and retailers of wireless and electrical goods and apparatus, electricians, mechanical engineers, &c. The directors are:—A. W. Young, Warwick Villa, Kennington Road, Bath, wireless and electrical engineer (managing director); Mrs. E. H. Young, same address; G. Young, 12, Foxcombe Road, Bath, manufacturer's chemist. Solicitors: Stone, King and Wardle, Bath. Registered office: Foxcombe Road, Bath.

Wireless Stores (Payne & Hornsby), Ltd. (7,452).—Private company. Registered in Dublin January 11th. Capital, £100 in £1 shares. Objects:—To acquire the business of radio engineers and wireless assemblers carried on by T. Payne and G. Hornsby at 34, Bachelors Walk, Dublin. The first directors are:—T. Payne, "The Laurels," Woodlands Estate, North Gosforth, Newcastle-on-Tyne; G. Hornsby, 2, Sydenham Terrace, South Shields, Co. Durham, radio engineer. Registered office not stated.

Hertz Radio Corporation, Ltd. (210,958).—Private company. Registered January 7th. Capital, £100 in 2,000 shares of 1s. each. Objects:—To acquire the trade name of the "Hertz Radio Corporation," to carry on business as manufacturers of, and dealers in wireless telegraphy and telephony instruments and component parts thereof, &c. The subscribers (each with one share) are:—H. L. Ledbury-Moore, 62, St. Benedict's Road, Small Heath, Birmingham, accountant; Lily Cantrill, 7, Gladstone Road, Yardley, Birmingham, secretary. The first directors are to be appointed by the subscribers. Qualification, 10 shares. Secretary: H. Oram, 55, Newhall Street, Birmingham.

Official Returns of Electrical Companies.

St. Austell and District Electric Lighting and Power Co., Ltd.—First mortgage debenture dated December 31st, 1925, to secure £20,000, constituting a first fixed charge on freehold and leasehold hereditaments at St. Austell and Luxulyan, rights of way, &c., and a floating charge on the company's undertaking and property, present and future, including uncalled capital. Holder: Solicitor for H.M. Treasury.

Cutting Bros. & Co., Ltd.—Particulars filed of £10,000 debentures authorised December 18th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Altrincham Electric Supply, Ltd.—Mortgage on land and premises, No. 60, Stamford New Road, Altrincham, Cheshire, dated December 23rd, 1925, to secure £6,250. Holders: National Provincial Bank, Ltd., 15, Bishopsgate, E.C.

G. W. M. Electrical Co., Ltd.—Particulars filed of £400 debentures authorised December 24th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Stratford-on-Avon Electricity Co., Ltd.—Particulars filed of £10,000 debentures authorised December 18th, 1925, charged on the company's undertaking and property, including uncalled capital, the whole amount being now issued.

Wireless Novelties, Ltd.—Satisfaction in full on November 23rd of debenture dated February 24th, 1925, securing £1,000.

Fryer & Hartley, Ltd.—Satisfaction is full on December 31st of mortgage or charge dated April 7th, 1925, securing £300.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Belgian Company.—The *Compagnie Centrale de l'Industrie Electrique*, of Brussels, which has an ordinary share capital of 4,000,000 fr., reports profits of 311,000 fr. for 1924-25. After writing off 300,000 fr. for depreciation, the balance is being carried forward. At the recent meeting it was stated that the company, together with a financial group, was participating in an increase in the share capital of the Compagnie d'Electricité de Sofia for the purpose of establishing a new Bulgarian station of 1,800-kW capacity.

Greenwood & Batley, Ltd.—An interim dividend of 2½ per cent. has been declared, as in 1925.

German Companies.—The *South German Telephone Apparatus, Cable and Wire Works Company*, of Nuremberg, after having written off 135,000 marks for depreciation, reports net profits of 280,000 marks for 1924-25.

The *Lloyd Dynamo Works Company*, of Bremen, proposes to reduce its share capital and to apply the book profits of 125,000 marks to depreciation and the covering of a possible loss for 1925. The capital will then amount to 2,150,000 marks, mainly in ordinary shares.

German Loan in America.—ELECTRICITY LOAN.—The Saxe-Anhalt Electric Works has concluded an agreement with Messrs. F. J. Lismann and Co., New York, for the issue of a loan of $1,000,000. The loan will be for a period of two years, and will bear interest at the rate of 6½ per cent.—*Financial News.*

Anglo-American Telegraph Co., Ltd.—The following final dividends are being paid:—Ordinary consolidated stock, £1 10s. per cent., less tax at 4s. 0½d. in the £, making £3 15s. per cent. for the year; preferred stock, £1 10s. per cent., less tax at 4s. in the £, making £6 per cent.; and deferred stock, £1 10s. per cent., less tax at 4s. 1½d. in the £ (first and final). All the dividends are the same as were paid for 1924.

Vulcanite, Ltd.—A report made up to October 31st last states that foreign competition has reduced the output of the fibre mill. The net profit was £1,232 and the amount brought forward £2,246. After allowing for taxation £2,486 is to be carried forward.

Brazilian Traction, Light and Power Co., Ltd.—A quarterly dividend of 1¼ per cent. has been declared on the ordinary shares. Three quarterly dividends of 1 per cent. have been paid previously.

Tata Companies.—It is reported that the Tata Hydraulic Power Co. has raised a loan of two crores of rupees, part of which (85 lakhs) is to be devoted to the redemption of the company's debentures, while the balance (115 lakhs) is to be used to finance the Tata Power Co.

Traction and Power Securities.—Final dividends of 2¼ per cent. on the preference stock and 9 per cent. on the ordinary stock are recommended. The past year's dividend on the ordinary stock is thus 13 per cent., as compared with 11 per cent. for the preceding year.

Reduction of Capital.—VICKERS, LTD. AND REDUCED.—A petition for the reduction of the capital of this company from £26,530,000 to £18,289,678 has been presented to the High Court, and will be heard in London on January 26th.

Stock Exchange Notice.—The undermentioned securities have been ordered to be officially quoted:—

Melbourne and Metropolitan Tramways Board.—Stock and partly-paid scrip for £300,000 5 per cent. stock, 1944.

Shanghai Electric Construction Co., Ltd.—The directors have declared a second interim dividend at the rate of 3 per cent. actual, less tax, in respect of the past year.

Herbert Morris, Ltd.—The dividends for the half-year ending January 31st have been declared on the cumulative preference shares.

Northern Mexico Power and Development Co.—The preference shares are to receive a dividend of 7 per cent. for the past year.

Edmundson's Electricity Corporation, Ltd.—An interim dividend of 3 per cent., actual, has been declared, as in 1925.

Stocks and Shares.

MONDAY EVENING.

THE Government's proposals for a great expansion of electrical distribution have been discussed with interest in the Stock Exchange, and have had a favourable effect upon prices of shares in those companies deemed likely to benefit if the scheme should become operative. The plan is welcomed as a long-overdue contribution to national well-being, but details are awaited while members of the Stock Exchange, who have little belief in the official capacity for running a business organisation, prefer to reserve considered opinions.

The first practical effect has been to put up prices of manufacturing companies' shares. Sharp rises have occurred in British Insulated, Enfield Cable, and Henleys. General Electrics are better at 30s. Electric Constructions and English Electrics have advanced. India Rubbers spurted to 24s. Aron Electricity Meters strengthened to 21s. 3d. It is thought that some of the engineering firms will be advantaged: Babcock and Wilcox are materially stronger at 54s. 6d. bid. The market argument is that any extensive development of electrical work is bound to be beneficial to the undertakings which deal in equipment. There is a shade of doubt as to whether the new arrangement will attract fresh business to the present supply companies.

The balance of price movements lies, however, in favour of shareholders. St. James' and Pall Mall ordinary are 5s. up, at 16; Kensingtons are equally better at 13¾. Bromptons rose to 35s. Several of the provincial issues are good, notably Bournemouths, which at 3¾ show a 3s. gain. Smaller improvements have been secured by Clyde Valley, Newcastle-on-Tyne, and Yorkshires. Urban ordinary put on 1s. 9d., and are now 20s. Westminsters and County ordinary proved exceptions to the general tendency, being 1/16th easier at 2 7/16ths and 59/6 respectively. The Government's proposals have drawn fresh attention to the various sections of the electricity market, and have served to stimulate business. They have proved useful as a set-off to the talk of a possible national crisis in April or May if the coal industry should push matters to extremes. This last consideration is responsible for a good deal of quiet uneasiness in the mind of investment, and comes inopportunely at a time when markets are depressed by fears of dearer money and disturbed by a widely-spread reaction in rubber shares after their boom.

The Home Railway market is worried by the coal outlook, and most of the prices are lower, the Undergrounds dipping with the rest. London Traction stocks are unaffected. British Electric Tractions maintain their strength. A drop in Brazilian Tractions was recovered, and the remainder of the group has barely moved.

Cable stocks keep steady. Any stock which comes to market is absorbed without difficulty. Great Northerns, ex their dividend, are better at 32, making allowance for the deduction. The wireless department is passive. Canadian Marconis at 4s. 10½d. are the turn better. In the cable manufacturing section, the difficulty is to buy shares, so meagre is the floating supply and so tightly held by investors is the balance.

Rubber shares have come back in sympathy with a drop from 4s. 6d. per lb., to 3s. 1d. per lb. in the price of the raw material. The fall in values has uncovered—to use the Americanism—a bull account which is proving a source of weakness to the market. Evidence shows, now, that the speculator too often helped himself to 5,000 shares when 500 would have been a more discreet number for him to handle. Other markets are affected by the necessity for raising funds, by sales of various stocks and shares, to pay for rubber commitments. Hence a general dullness round the Stock Exchange and a mere bleating of business instead of a lusty roar of activity.

The funeral took place on Tuesday in this week, of the late Mr. George Duckworth Atkin, to whose enterprise and courage the electricity supply market owes no small part of its popularity to-day. He was amongst the first of the Stock Exchange men who realised, years ago, the tremendous part which electricity would play in the life of the community. He started to deal in the shares of the various companies, and founded a business which is now one of the most important in the Stock Exchange. Mr. G. D. Atkin was the best-known man in the House, and his sudden death in his office, on a bitterly bleak morning, came as a blow to his fellow-members, amongst whom he enjoyed a unique measure of popularity. His death is a loss to the electrical industry, as well as to his hosts of friends. Upon his memory there may be fittingly laid the tender tribute of farewell: *Placide requiescat.*

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	1924.	Price Jan. 18 1926.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	13	14	3½	+3/-	4 9 7
Brompton Ordinary	1	10	10	12	+1/3	*5 14 3
Charing Cross Ordinary	1	14½	15	49/6	—	6 1 8
do. do. 4½ Pref.	1	4	4½	17/6	—	5 2 10
Chelsea	1	19	19	2 7/16	—	5 9 9
City of London	1	15	15	50/9	—	5 18 1
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/6	+1/-	5 4 11
County of London	1	15	15	59/6	—1/3	5 0 10
do. do. 6% Pref.	1	6	6	22/-	—	5 9 1
Edmundson's Ordinary	1	7	7	24/6	—	5 14 5
do. 7% Pref.	1	6	7	22/-	+6d.	6 7 3
Elec. Supply Corporation	1	10	10	23/6	—	6 3 0
Kensington Ordinary	5	14	15	13½	+½	5 9 1
Lancs. Light and Power	1	7½	7½	28/6	+ 6d.	5 18 2
London Electric	1	10	10	33/6	—	5 19 5
do. do. 6% Pref.	5	6	6	5 7/16	—	5 7 10
Metropolitan	1	10	11	40/6	—	5 8 7
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	23/9	—	5 1 1
Newcastle-on-Tyne Ordinary	1	6	7	23/9	+1/3	5 17 11
do. 5% Pref.	1	5	5	18/9	—	5 6 8
do. 7% Pref.	1	7	7	24/6	—	5 14 5
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	16	+¾	5 9 3
South London	1	15	15	2½	—	5 18 1
South Metropolitan Pref.	1	7	7	1½	—	5 12 8
Urban Ordinary	1	4	4	1	+1/9	4 0 0
do. 6% Pref.	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	2 1/16	— 1/16	6 3 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/9	+9d.	7 11 11
Yorkshire Elec.	1	8	8	21/-	+6d.	5 3 0

HOME RAILS.

Central London Ord. Assented	Stock	4	4	68	—	5 17 8
Metropolitan	,,	4	5	69	—½	7 4 11
do. District	,,	8½	8½	47½	—1	7 7 4
Underground Electric Ordinary	10	Nil	Nil	2½	—¼	Nil
do. do. "A"	1/-	Nil	Nil	7/-	- 6d.	Nil
do. do. Income	Bonds	6	6	98	—	*6 2 5

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	109	—	5 16 6
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	3	6	53/9	—	2 4 10
Chili Telephone	5	6	5	6 1/16	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6½	—	7 8 2
Eastern Extension	10	10	10	18	+ ½	*5 11 1
Eastern Tel. Ord.	Stock	10	10	176½	+1	*5 13 4
Globe Tel. and T. Ord.	10	10	10	18½	—	*5 8 1
do. do. Pref.	10	6	6	11	—	5 8 4
Great Northern Tel.	10	22	22	32	—1	6 17 6
Indo-European	25	7	8½	45½	—	*4 18 5
Marconi		10	10	1 1/16	—	7 12 4
Marconi Marine	1	10	7½	8	—	8 11 6
Oriental Telephone Ord.	1	12	12	42/6	—	*5 12 11
United R. Plate Tel.	5	8	8	7½	+1/8	5 1 7
Western Telegraph	10	10	10	18	—	*5 11 1

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	8½	—	8 9 2
do. do. 2nd Pref.	5	6	6	9 1/16	—	9 8 2
do. do. 5% Deb.	Stock	5	5	73½	—	6 16 3
British Electric Traction Ord.	,,	6	6	119½	—	5 0 0
do. do. 6% Pref.	,,	6	6	105	—	5 14 3
Brazil Traction	100	4	4	84	+½	4 15 3
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	89½	—	5 19 9
do. do. Preferred	,,	90/-	90/-	102½	—	*4 12 8
do. do. Deferred	,,	129/6	129/6	127	—	*5 2 4
do. do. Deb.	,,	4½	4½	77	—	5 10 5
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	3/6	—	Nil
London United Tram. Deb.	Stock	4	4	40½	—	9 17 6
Mexico Trams. 5% Bonds	—	5	5	69½	—	8 0 0
Mexican Light Common	100	Nil	Nil	81½	—	Nil
do. Pref.	100	Nil	Nil	61½	—	Nil
do. 1st Bonds	—	5	5	70½	+1½	7 1 10
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	54/6	+ 3/3	*4 8 1
British Aluminium Ord.	1	5	10	38/-	—	5 5 3
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3 1/16	+5/-	4 16 0
Brush Ord.	1	10	10	28/-	—	7 2 10
Callenders	1	15	15	8½	—	4 12 4
do. 6½% Pref.	1	6½	6½	22/6	—1/3	5 15 7
Crompton Ord.	1	Nil	Nil	16/3	—	... ...
Edison-Swan	4/-	10	10	9/-	—3d.	4 8 11
do. 5% Deb.	Stock	5	5	83	—	6 0 6
Electric Construction	1	10	10	33/9	+ 1/16	5 18 4
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	19/9	+6d.	5 2 7
do. do. Pref.	1	6	6	20/6	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	5	7½	30/-	+9d.	5 0 0
Henley	1	15	16	3½	+¼	4 8 5
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	24/-	+2/9	*4 8 4
Johnson & Phillips	1	10	10	56/3	—	3 11 1
Met-Vickers, Ord.	1	8	8	27/-	—	5 18 6
do. Pref.	2	8	8	22	—	6 14 9
Siemens Ord.	1	—	7½	33/6	—1/6	4 9 7
Telegraph Construction	12	20	20	27	—	*4 9 9

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price January 19th.	Fortnight's Inc. or dec
a Acid, Oxalic ... per lb.	6¾d.	...
a Ammoniac, Sal ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£19	...
a Bisulphide of Carbon ... ,,	...	...
a Borax ... ,,	£35	...
a Copper Sulphate ... ,,	£25 10s.	...
a Potash, Chlorate ... per lb.	4d. to 4¼d.	...
a ,, Perchlorate ,,	5½d.	...
a Shellac ... per cwt.	£15 15s.	...
a Sulphur, Commercial ,,	£8 10s.	...
a ,, Roll ,,	£8 10s.	...
a Soda, Chlorate per lb.	3½d. to 3¾d.	...
a ,, Crystals per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... per ton	£120 to £125	...
b ,, Wire ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ,,	1/8 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... per ton net	£251	£6 dec.
Grade II ,, ,,	£178	£4 dec.
Grade III ,, ,,	£101	...
c Brass (rolled metal 2" to 12" basis) per lb.	9½d.	...
c ,, Tubes (solid drawn) ,,	1/- to 1/0½	...
c ,, Wire, basis ... ,,	10½d.	...
c Copper Tubes (solid drawn) ,,	1/1	...
c ,, Bars (best selected) ... per ton	£90	...
c ,, Sheet ... ,,	£90	...
c ,, Rod ... ,,	£90	...
d ,, (Electrolytic) Bars ,,	£65 10s.	15/- dec.
d ,, ,, Sheets ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£75 10s.	15/- dec.
d ,, ,, H.C. Wire per lb.	9½d.	¼d. dec.
f Ebonite Rod ... ,,	2/8 to 2/9	...
f Sheet ... ,,	2/8 to 2/9	...
n German Silver Wire ,,	2/2	...
h Gutta-percha, fine ... ,,	6/6	...
h India-rubber, Para fine ... ,,	3/2	8d. dec.
l Iron Pig (Cleveland Warrants) ... per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£12	...
g Lead, English Pig ... ,,	£35 15s.	25s. dec.
g Mercury ... per bot.	£15 2s.6d.to £15 5s	...
e Mica (in original cases) small ... per lb.	8d. to 4/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/0½	...
p ,, ,, drawn bars & rods ,,	1/0	...
p ,, ,, rolled strip & sheet ,,	1/0½	...
p ,, ,, wire ... ,,	1/0½	...
o Platinum ... per oz.	£36	...
d Silicium Bronze Wire ... per lb.	1/0½	...
r Steel, Magnet, in bars ,,	7½d.	...
n Tin, Block (English) ... per ton.	£277 to £278	£9 10s. to £10 dec.
n ,, Wire, Nos. 1 to 16 ... per lb.	4/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Proposed Electricity Supply to Sicily.—According to the *Electrical World* a scheme is at present under consideration to supply electricity to the island of Sicily from the hydro-electric power station in Calabria, the southern province of Italy. Three plans for transmission at 130,000 volts across the Straits of Messina, which at the narrowest point are 2.15 miles wide, have been prepared. The first provides for an overhead line, supported at each end on steel towers, 993 ft. high. It is estimated that there would be a sag of 770 ft. from the horizontal in the centre of the line. The second scheme provides for the construction of two 656-ft. shafts and a 2¼-mile tunnel beneath the Straits at a distance of 378 ft. below sea level. The third scheme proposes a new type of submarine cable, made by Pirelli's. This cable, although laid on the bed of the sea, would, it is claimed, be capable of successfully transmitting the necessary electrical energy.

Proposed Duty on Imported Electricity.—A Swiss correspondent informs us that the rumour that Italy is going to tax imported electrical energy is causing a certain anxiety in Switzerland. For some years it has been a very important "article" of exportation from Switzerland, the power provided for Italy during last year being about 76,000 kW. Several power stations have been set up specially with a view to exporting electricity to Italy, and if the latter country taxes Swiss energy, the suppliers will be faced with unexpected difficulties. It is said that the proposed tax will be 30 per cent. of the wholesale price of the electricity, which is considered excessive in electrical circles, but as the Italians are determined, so far as lies in their power, to protect Italy, it is quite probable that the new duty will be as high as the figure mentioned.

Exports and Imports of Electrical Goods and Machinery in December, 1925.

Two Years' Figures Compared.

THE Board of Trade Returns for December mark the close of another year, and we are therefore enabled to give, in addition to our monthly table, a comparison of the individual items for the years 1924 and 1925. To illustrate further the course of trade, we have also prepared a number of curves relating to the principal items of export and import.

A study of the December figures reveals a fairly satisfactory increase in the export section, an increase which was well distributed over the items. The most important rises occurred in the cases of unenumerated electrical machinery, "other motors and generators," and submarine telegraph and telephone cable; the last item sprang up by over £57,000, and it is perhaps worthy of mention that this item fluctuated during 1925 between the upper and lower limits of £442 and £424,913, greatly influencing each month's figures. The only decrease of importance during December was the fall of £21,000 in the exports of glow lamps. Comparing the figures with those for December, 1924, it will be seen that, although there were one or two serious decreases, generally the increases predominated, and the net result was an increase of £70,226.

There was also an increase in the import section as compared with November, 1925, rises in unenumerated goods, apparatus and machinery, and cables more than compensating for a drop of £50,786 in batteries and accumulators. Comparing the figures with those for December, 1924, there was a decrease of £36,683, due mainly to a fall of £63,537 in telegraph and telephone instruments and apparatus, and one in batteries and accumulators, which were not counterbalanced by the rises in cables and unenumerated goods. The re-export section does not present much of interest, but it may be pointed out that there was a general rise as compared with the preceding month, and only two decreases of any importance.

Turning to the yearly figures, it will be seen that unenumerated electrical machinery reached the first place during 1925, although the exports of telegraph and telephone apparatus, which were the chief items in 1924, continued to grow. The greatest jump was made by submarine telegraph and telephone cable, and here it may be pointed out that the total given for 1924 shows a considerable difference from that given in the December, 1924, returns. This discrepancy, which amounts to about £500,000, is apparently due to the inclusion of a large item or some large items which were for some reason not available until after the close of the year. Important increases occurred in several other items, for instance, batteries and

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Dec., 1925.	Inc. or dec. as compared with Nov. 1925.	Inc. or dec. as compared with Dec., 1924.	Electrical imports for Dec., 1925.	Inc. or dec. as compared with Nov., 1925.	Inc. or dec. as compared with Dec., 1924.	Electrical re-exports for Dec., 1925.	Inc. or dec. as compared with Nov., 1925.	Inc. or dec. as compared with Dec., 1924.
Electrical goods and apparatus (unenumerated)	£156,476	— £3,723	— £5,216	£130,825	+£11,648	+£23,445	£5,642	—£1,076	+£1,435
Insulated wires and cables ...	253,414	+ 5,753	+ 22,769	74,159	+ 26,367	+ 23,248	661	+ 88	— 330
Glow lamps	40,289	— 21,263	+ 9,595	36,941	+ 3,731	+ 691	425	+ 338	— 189
Arc lamps and parts	1,003	— 160	+ 344	1,518	— 519	— 339	12	+ 7	— 34
Batteries and accumulators ...	75,137	— 3,344	— 19,922	50,528	— 50,786	— 23,953	544	+ 35	— 1,509
Meters and instruments ...	28,228	— 5,590	— 6,894	22,767	+ 4,455	+ 6,602	1,699	+ 1,132	+ 723
Carbons	1,120	+ 691	— 61	9,262	— 4,466	+ 1,168	454	+ 335	+ 372
Electrical Machinery—									
Electrical machinery (unenumerated)	301,035	+ 77,830	+ 48,529	102,306	+ 23,706	— 7,767	7,805	+ 43	+ 2,259
Railway and tramway motors	45,750	+ 1,872	+ 7,590	—	—	—	—	—	—
Other motors and generators ...	197,633	+ 69,382	+ 22,922	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	9,100	+ 3,038	+ 2,409	225	— 151	+ 174	30	+ 30	+ 30
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	62,794	+ 8,819	— 1,197	14,565	— 3,393	+ 3,585	64	— 1,486	+ 64
Submarine telegraph and telephone cable	58,237	+ 57,795	— 31,141	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	217,196	— 7,887	— 41,783	76,936	— 808	— 63,537	5,412	+ 1,972	+ 1,396
Totals	£1,447,412	+£183,213	+ £70,226	£514,032	+£10,054	—£36,683	£22,748	+ £1,418	+ £4,217

[The Figures for 1924 and 1925 compared.]

	Exports.			Imports.			Re-exports.		
	Electrical exports, 1925.	Electrical exports, 1924.	Inc. or dec. in 1925 as compared with 1924.	Electrical imports, 1925.	Electrical imports, 1924.	Inc. or dec. in 1925 as compared with 1924.	Electrical re-exports 1925.	Electrical re-exports 1924.	Inc. or dec. in 1925 as compared with 1924.
Elecl. goods and apparatus (unenumerated) ...	£1,823,520	£1,886,683	— £63,163	£1,186,481	£1,005,659	+£180,822	£87,611	£67,471	+£20,140
Insulated wires and cables	2,664,433	2,506,467	+ 157,966	608,171	455,588	+ 152,583	16,187	4,230	+ 11,957
Glow lamps...	510,504	341,246	+ 169,258	426,299	215,234	+ 211,065	8,333	8,551	— 218
Arc lamps and parts ...	16,312	10,547	+ 5,765	16,025	13,654	+ 2,371	2,137	1,118	+ 1,019
Batteries and accumulators	973,097	742,134	+ 230,963	638,129	377,780	+ 260,349	13,673	4,696	+ 8,977
Meters and instruments ...	351,100	446,204	— 95,104	270,211	190,415	+ 79,796	11,353	12,308	— 955
Carbons	23,417	27,385	— 3,968	101,536	119,129	— 17,593	2,306	2,087	+ 219
Electrical Machinery—									
Electrical machinery (unenumerated)	3,060,459	2,454,125	+ 606,334	1,084,686	1,072,446	+ 12,240	66,861	87,361	— 20,500
Railway & tramway motors	545,637	577,819	— 32,182	—	—	—	—	—	—
Other motors and generators	2,155,831	2,321,141	— 165,310	—	—	—	—	—	—
Switchboards (not telegraph or telephone) ...	88,154	90,918	— 2,764	1,784	501	+ 1,283	1,408	1,753	— 345
Telegraph and Telephone Cable and Material.—									
Telegraph and telephone wires and cable (not submarine)	705,357	1,021,999	— 316,642	186,483	122,132	+ 64,351	8,371	3,859	+ 4,512
Submarine telegraph and telephone cable	1,601,401	948,156	+ 653,245	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus...	2,831,403	2,659,214	+ 172,189	835,744	871,830	— 36,086	72,539	54,794	+ 17,745
Totals	£17,350,625	£16,034,038	+ £1,316,587	£5,353,549	£4,444,368	+ £911,181	£290,779	£248,228	+£42,551

accumulators (£230,963), telegraph and telephone apparatus (£172,189), glow lamps (£169,258), and insulated wires and cables (£157,966). There was a large decrease in non-submarine telegraph and telephone cables, and the exports of "other motors and generators" and meters and instruments also declined to a considerable extent.

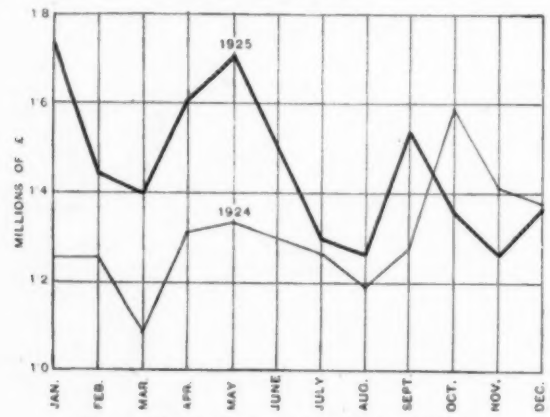


Fig. 1.—Monthly Exports During 1924 and 1925.

In the import section there were only two decreases as compared with 1924—in carbons and in telegraph and telephone apparatus. In the case of the latter, this was accompanied, as has been shown, by an appreciable increase in exports, as well as in re-exports. The growth of the radio industry is

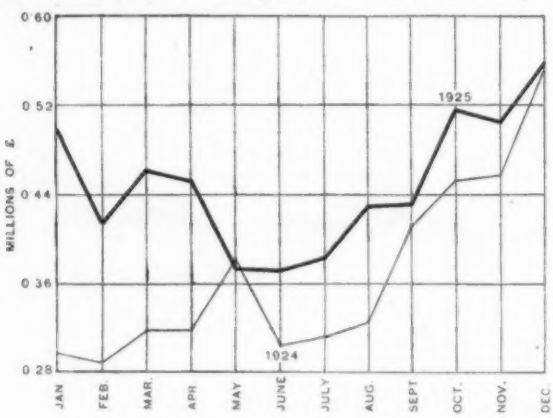


Fig. 2.—Monthly Imports During 1924 and 1925.

no doubt indicated by the rise of £260,349 in the imports of batteries and accumulators, and improved lighting may account for the rise of £211,065 in glow lamp imports. Other notable increases occurred in imports of unenumerated electrical goods, insulated wires and cables, and meters and instruments. The

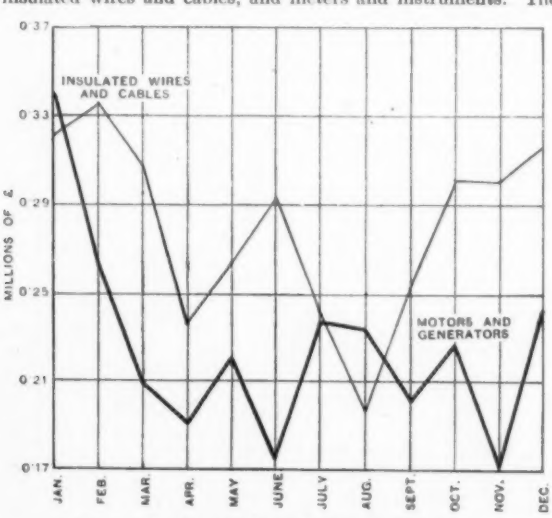


Fig. 3.—Exports of Cables and Motors and Generators.

re-export list shows principally increases resulting in a net rise of £42,551.

The curves are practically self-explanatory. The first (fig. 1) shows that exports remained above those of 1924, month by month, until October, but they practically regained the 1924 level by the end of the year. Fig. 2 compares the monthly imports during 1924 and 1925, and it is seen that, except for the drop in May, the figures remained above those for 1924 throughout the year. Fig. 3 shows the monthly exports of two outstanding items. For convenience the items "railway and tramway motors" and "other motors and generators" have been combined, and the curve relating to insulated wires

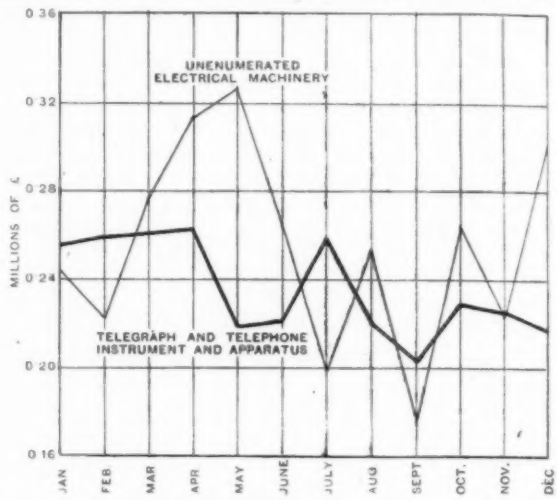


Fig. 4.—Exports of Machinery and Telegraph and Telephone Apparatus.

and cables includes non-submarine telegraph and telephone cables. Two other leading export items are illustrated in fig. 4, telegraph and telephone instruments and apparatus and unenumerated electrical machinery. The item fifth in im-

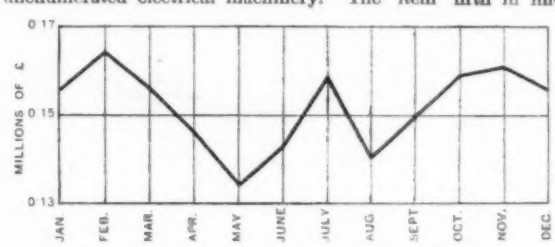


Fig. 5.—Exports of Unenumerated Electrical Goods.

portance in the export section is depicted in fig. 5. A larger scale is used which exaggerates the fluctuations, although unenumerated electrical goods was the item with the smallest variations. Fig. 6 presents curves of the three principal

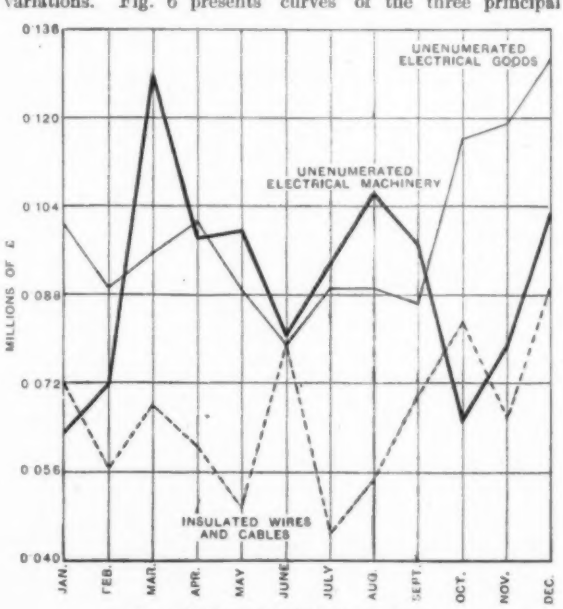


Fig. 6.—Three Principal Import Items.

import items, and again the curve of insulated wires and cables includes non-submarine telegraph and telephone cables.

It is satisfactory to note that although exports during 1925, as a whole, decreased from £800,967,000 to £773,086,000, the section with which we are particularly concerned showed a substantial rise. Again, while there was generally an excess of imports over exports of £549,772,000 (excluding bullion and specie), in the electrical branch there was a favourable balance of £11,955,076.

The Physical Society's Exhibition.

Annual Display of Electrical Instruments and Scientific Apparatus.

(Continued from page 92.)

Morgan Crucible Co., Ltd.

The various articles on this stand illustrated the scope of "Morganite" material for the manufacture of resistor elements of either low or very high ohmic value, with a specific

Fig. 9.—Circular Hot Plate.

resistance ranging from 0.01 to 100×10^3 ohms inch cube. Domestic hot plates are shown in figs. 9 and 10, fig. 11 illustrating one of several patterns of portable radiators. Heaters are also made for fixing flat on a wall or floor skirting without

Fig. 10.—Domestic Hot Plate.

risk of scorching; as they occupy the minimum space, they should be very serviceable in confined spaces. For laboratory and industrial use a plain hot plate is made, resting on an

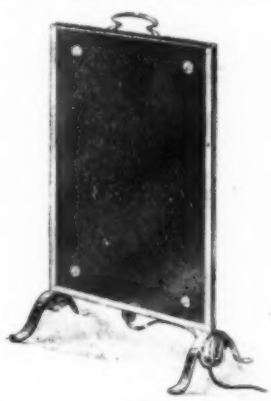


Fig. 11.—Portable "Morganite" Radiator.

earthenware tile. The ceramic, porcelain-like nature of these heaters enables them to be washed like china ware, and there are no metal parts to require cleaning.

Evershed & Vignoles, Ltd.

The representative display on this company's stand included two new items. One instrument is a development of the well-known "Megger," and has been designed to overcome the difficulties which have been experienced in measuring the resistance of earth plates. The trouble has been to eliminate back e.m.f. due to electrolysis under moist soil conditions and stray leakage currents. It has been necessary to find a method of eliminating these outside factors and making sure that the resistance measured is that of the earth plates alone, and also that this value should be accurate, for the "three-reading" method involves complex calculations and is not always accurate, as conditions may change during the test. It would seem that the use of alternating current would cancel out both electrolytic back e.m.f. and vagabond currents, but it has been impossible in the past to use a.c., because the true ohmmeter, such as that used in the "Megger" testing set, is of the moving-coil type, which requires direct current. The difficulty can be overcome in a very simple manner by providing a.c. for the earth plate and d.c. for the ohmmeter; which has been accomplished by using a specially-constructed "Megger" set having a mechanically-operated reversing switch on the same shaft as the generator armature, interposed electrically between the earth plate and ohmmeter section of the testing circuit.

The electrical recorder has made very rapid strides of late, and Messrs. Evershed & Vignoles have constructed several special instruments recently of considerable interest. The integrating weight recorder shown in fig. 12 is similar to those

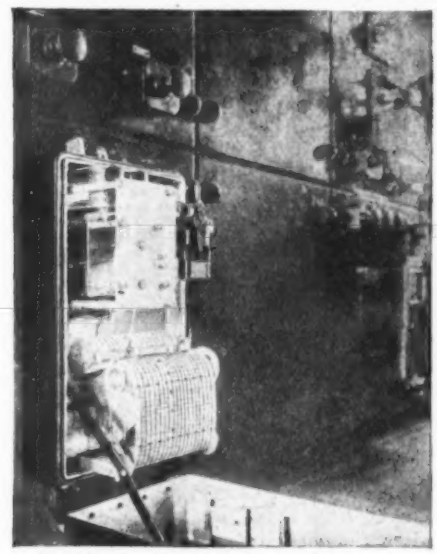


Fig. 12.—Evershed Integrating Weight Recorder.

supplied to Messrs. Henry Simon, Ltd., for installation in grain elevators, the purpose being to provide a record of the operation of an automatic tip weigher. The movements of the latter are shown in the form of a stepped chart, each step representing one movement of the weigher. An arrangement is provided by means of which the pen is returned automatically to its zero position at hourly, or other, intervals (fig. 13), the

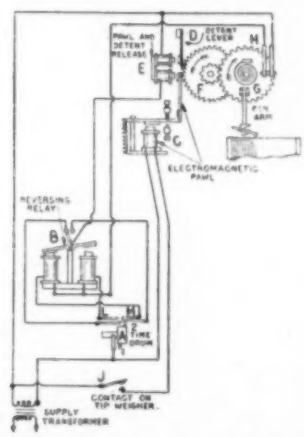


Fig. 13.—Diagram of Integrating Mechanism.

total amount handled by the tip weigher hourly being shown by the length of the hourly total. The recorder shows the regularity, or otherwise, of the operation of the tip weigher in addition to the total number of operations per hour. The instrument is of the duplex type, the record of the operations of the tip weigher being shown on the same chart roll with the power consumption of the operating motor. (Current, pressure, speed, &c., could be shown.) The value of a duplex chart of this kind can readily be appreciated from the fact that irregularities in the operation of the tip weigher can be checked against corresponding fluctuations in the power consumption of the motor. The tip weigher may be concerned with grain, or it may deal with fuel, or any other material in bulk, and

the same principle of operation may be used for checking any automatic machine operations, indicating the headway of tramcars, &c.

The method of operating the "weight" portion of the recorder is shown by fig. 13; a transformer supplies operating current at 25 volts, and the pen-arm mechanism includes the gear wheels F and G, the latter carrying the pen, and the wheel movement being controlled by the electro-magnetic pawl C and the lever D. When the tip weigher moves, contact J closes momentarily, the circuit including C being completed, and the arm attached to C is pulled down; the gear train is moved one notch and held by lever D, carrying with it the pen one step to the left on the chart. The next operation of the weigher again closes J, repeating the cycle and carrying the pen another step to the left. The integrating mechanism by means of which an hourly total of the weight handled is provided, is controlled by the drum A, which carries arms 1 and 2, making contact with L and M alternately at intervals of one hour (as the arms are diametrically opposed on the drum, which revolves once in two hours). When arm 2 reaches M it energises electro-magnet E, which pulls down pawl C and lever D from the ratchet wheel, thus allowing the spring-controlled gear train to return the pen to its zero position. Contact H is consequently closed, and B switches F out of circuit, so that the pawl and detent lever fall into position again ready to operate at the next movement of the tip weigher. At the end of the next hour arm 1 closes contact L, and the cancellation is made in a similar manner to that described above.

Two new ranges of the "Meg" insulation tester are shown for the first time; the 100-volt 20-megohm and the 250-volt 50-megohm ranges, both supplied with variable or constant-pressure generator, for testing grid leaks, anode resistances, the insulation of low-pressure lighting circuits, and for the telegraph companies. The recording "Dionic" tester provides a continuous record of the changes in the impurity content of condensate, boiler feed, &c., and has been considerably improved in detail. The instrument exhibited was similar to those installed in Valley Road electricity works, Bradford, Barton Bridge power station, Manchester, and the new Barking station.

Nalder Bros. & Thompson, Ltd.

Amongst the apparatus on this firm's stand the well-known "N.C.S. Ideal" series of a.c. instruments included watt-meters, ammeters, voltmeters, rotary power-factor indicators, rotary synchroscopes, and deflectional frequency meters. The latter three classes of instruments are of the "Nalder-Lipman" moving-iron pattern and a novelty was the combined power factor meter and ammeter for use in the control rooms of large stations (fig. 14). The two meters are housed in a rectangular case measuring 10¼ in. by 5¼ in. by 5 in., which can thus be mounted side by side, taking up very little space.

Another new apparatus is the steam turbo-alternator efficiency indicator (Turner's patent), the electrical portion of which is illustrated in fig. 15. The complete indicator may be considered as a combination of two pieces of apparatus: (i) An indicating wattmeter operating the "Willans line" drum, and (ii) a Venturi, or any other, watermeter indicating the steam

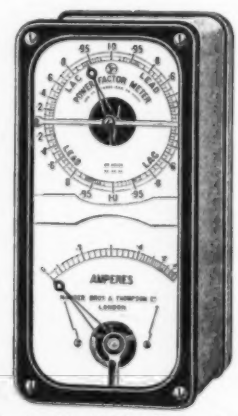


Fig. 14.—Combined P.F. Meter and Ammeter.

consumption of the machine. Alternatively, a steam-flow meter can be used, but it is not considered that this is as satisfactory as a water-flow meter. The wattmeter is of the unbalanced-load induction type of special design, but, instead of being fitted with a pointer, the scale of kilowatts is delineated on the lower periphery of a drum. On the drum is delineated the "Willans line" of the particular machine in connection with which the instrument is to be used, as well as lines above and below this, showing definite percentage variations therefrom.

As the drum rotates the portion of the "Willans line" corresponding with the load on the machine is visible and the guaranteed steam consumption at this load is read on a vertical scale which is parallel with the axis of the drum and at right angles to the wattmeter scale. On the opposite side of the same vertical scale a pointer moves up and down which is actuated by the water or steam-flow measuring apparatus dealing with the condensate or steam. This indicates the actual steam consumption against the kilowatt output, and it can be seen immediately whether the consumption is in accordance with, or is better or worse than, the guaranteed figure without the necessity of having to make a number of carefully-organised simultaneous readings on the different instruments usually situated in different places, and a subsequent reference to the guaranteed steam consumption figures of the machine. This combined instrument should be of material use in ensuring that the general conditions of working of the machine are being properly maintained.

Should the steam consumption be indicated as too high, and it is observed that this is not due to a low steam pressure, steam temperature, or vacuum, then the reason may be looked

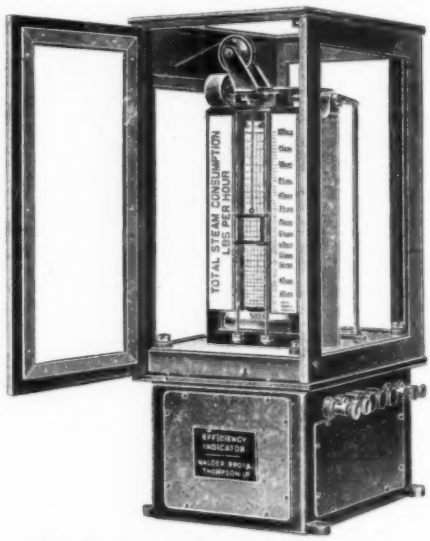


Fig. 15.—Steam Turbine Efficiency Indicator.

for in hot bearings or in deterioration or damage to turbine blading, nozzles, and/or diaphragms, or in leakage of steam through blading running clearances and labryinths or other glands. Causes which, without the instrument, might continue untouched for a considerable period can thus be detected without unnecessary and costly delay, and the risk of possibly a serious breakdown can be obviated. The readings can be logged as part of the regular station routine and thus provide a continuous check on any deterioration from the guaranteed efficiency, and incidentally show any improvement that there may be in the running.

A complete line of protective relays was also shown, including super-sensitive (Fawssett Parry patent) types and relays for Merz-Price protection systems and developments thereof.

Dubilier Condenser Co. (1925), Ltd.

This firm's products need no introduction; they included devices of varied kinds, both for "broad-catchers" and commercial work. Condensers for high-power circuits can be supplied for radio-frequency currents up to 250 amperes and for audio-frequency voltages exceeding 60,000 volts. Mica insulators for continuous-wave radio apparatus involve small losses and are reliable in prolonged service, and a compact arrangement of condensers in a metal box is made for reducing radio interference due to sparking dynamos, motor-cars, &c. Besides the neon-lamp wavemeter the firm's short-wave heterodyne wavemeter has a tuning range of from 50 to 500 m. and is provided with a screened case to eliminate hand-capacity effects. As its name implies, the "Univane" condenser is so arranged that the rotation of the knob of the condenser moves only one vane of the set at a time. As soon as one movable vane interleaves with the fixed vanes, a second is rotated into position as the knob is turned, and thus the full movement from minimum capacity to maximum requires several complete revolutions of the knob, which enables very fine tuning to be obtained. The number of times that the knob has been turned is shown on a small auxiliary indicator attached to the front of the instrument alongside the dial.

Mullard Radio Valve Co., Ltd.

Besides the Holweck molecular pump, a fine range of valves was on view, and it was noticed that a new range of modulating valves has been added to cope with the increase of broadcast telephony transmission, ranging from 150 to 600 watts; also a rectifying valve of special low impedance for service use, and a special valve for dealing with small powers at voltages up to 30,000 r.m.s. The glass transmitting valves have been modified to permit of satisfactory operation on wave-lengths down to 20 metres, and a recent addition to the range is the T.5A, rated at 1 kW anode dissipation, suitable for transmission on the shorter wave-lengths. Two new water-cooled transmitting valves displayed can deal with an input of from 30 to 35 kW.

(To be continued.)

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Agricultural Electric-Motor Outfit.

The accompanying illustration, fig. 1, is of a 6-h.p. electric motor and starting equipment combination, one of a range of such portable sets which is being produced in Austria for agricultural purposes. The equipment is mounted on

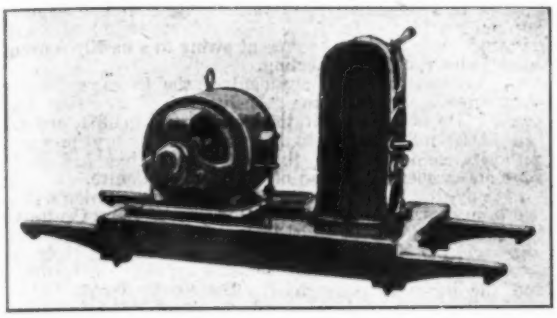


Fig. 1.—Agricultural Electrical Equipment.

either hand carriers or two- or four-wheel trucks. In the former case the hardwood bearers are provided with four short spikes by which a secure foundation for the set on the ground is secured.

An Electro-Magnetic Fuel Pump.

A considerable advance will probably be made in the direction of the fuel feed for automobiles by the introduction of the "Autopulse," fig. 2, a production of Zephyr Carburettors, Leamington, in this country, for which MESSRS. R. M. PAPELIAN, LTD., Wolseley House, Piccadilly, London, W.1, are the sole concessionnaires for Europe. The device forms, it is claimed, a small, durable and very efficient pump, giving about 5,000 strokes to a gallon of fuel at the rate of from 800 to 1,000 strokes per minute. The length of the stroke is from 0.025 in. to 0.030 in. The pumping element takes the form of a bellows into which the petrol is drawn through a strainer and a valve situated in the centre. Attached to the bottom of the bellows is a metal disk or armature, which is actuated by a special electro-magnet element. The coil of the latter is controlled by an ignition switch, and the attraction

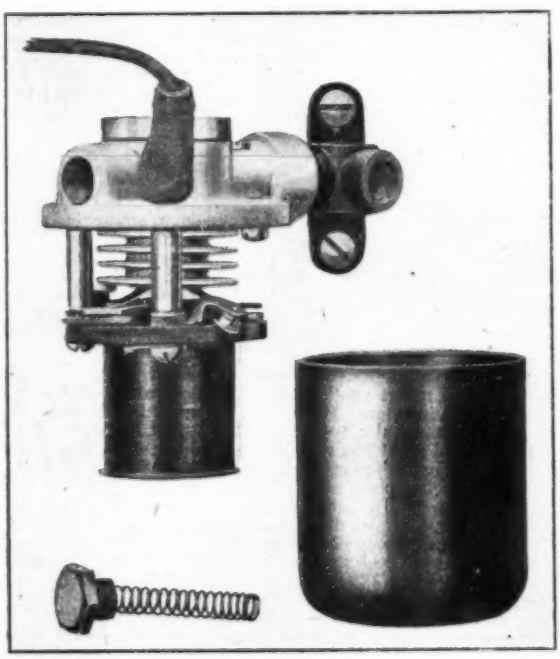


Fig. 2.—Electro-Magnetic Fuel Pump.

of the armature when the coil is energised represents the suction stroke. The delivery stroke is effected, when the coil is de-energised, by a spring placed vertically and centrally in the coil. This is stressed by the magnetic pull on the armature during the suction stroke, and in consequence applies the necessary pressure to close the bellows in return. Arcing at the switch contacts is claimed to be reduced to vanishing point by means of a "short-circuited" secondary winding in which a demagnetising current is induced, neutralising the effect of self-induction at the time of the break. The device is made up in combinations suitable for any number of cylinders.

A Novel Electrical Cooker.

An interesting electric cooking device in which, it is claimed, a whole meal may be cooked in one utensil, is described in *Electrical Merchandising*. The cooker, fig. 3, which is a pro-

Fig. 3.—One-Utensil Electric Cooker.

duction of the SELFSEAL PRESSURE COOKER COMPANY, 92, 150th Street, Jamaica, N.Y., consists of a cylindrical outer vessel of strong enamelware, in which white-enamel inset dishes are accommodated in a combined meat rest and lifting rack.

An Electric Light Extension Bracket.

A recent introduction into the electric-lighting field is an extension-bracket lighting fitting, fig. 4, produced by the SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, London, W.C.2. It is designed for use in workshops and offices, &c., where it is desirable to vary within small limits the

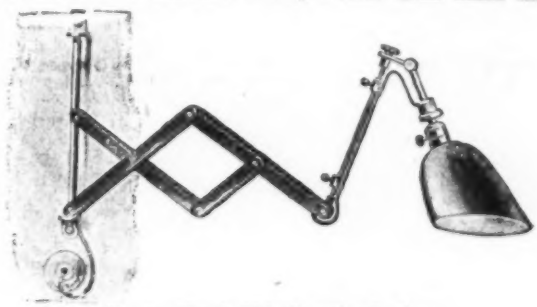


Fig. 4.—Electric Light Extension Bracket.

position of the source of light. The brackets are adjustable in any position within a radius of 180 deg. and at any distance up to 5 ft. extension. The reflectors are of aluminium, especially designed to effectively shield the eyes of the user from all harmful glare. The device is supplied in either black enamel or nickel-plate finish.

An Improved Conduit Fitting.

A new design of continuity conduit fitting which should prove of interest to electrical contractors, wiremen, &c., has recently been put on the market by the SECURITY FOUNDRY CO., LTD., Birmingham Road, Oldbury. The fitting is of the split pattern, the two halves being hinged at one side. Near each aperture are provided two internally-projecting collars, half on each section, which are designed to grip the conduit when the fitting is tightened up. Lugs with free and screwed eyelets are provided on the opposite side to the hinges so that the gripping is effected by means of small screws, which are tightened up after the conduit and wires have been assembled. It is claimed that efficient continuity is obtained with this device. Accessibility for inspection and the other advantages of the split fitting are also features of interest.

A New Electric-Lamp Lock.

We have received a sample of another form of electric lamp lock, designed to prevent the removal of lamps by unauthorised persons, which is being marketed by MESSRS. FRANCIS LAMP LOCKS, LTD., 83, Pall Mall, London, S.W.1. The device consists of an inner collar which is screwed into an outer one. A clutch gear allows the two parts to be turned in one direction only so that the combined device can be lengthened but not shortened. It is placed over the bottom of the holder with the inner collar at the top, and the lamp is inserted afterwards. The combination is then "expanded" so that a turn-in flange on the inner collar will lock at the ridge at the bottom of the thread on the lower portion of the holder, and the bottom of the outer collar will lock at the top of the glass bulb below the cap.

The Institution of Electrical Engineers.

South Midland Centre, Annual Dinner.

THE annual dinner of the South Midland Centre of the Institution of Electrical Engineers was held at the Grand Hotel, Birmingham, on Wednesday, January 13th, the chair being occupied by Mr. F. J. Moffett, chairman of the Centre. Covers were laid for some 300 members and guests.

Mr. J. SMEDLEY-CROOKE, M.P. for Deritend, Birmingham, proposed the toast of "The Institution of Electrical Engineers." He spoke of the great influence which the Institution had attained in the country, and emphasised the value of the work which had been done for the industry both during and since the war.

Mr. R. A. CHATTOCK, president of the Institution, in responding, pointed out that the uses of electricity were growing from day to day and it was the duty and work of the Institution to help that development along. The success of the Institution seemed to have inspired certain members of the engineering profession to try to go one better. He referred to the proposals made recently to form new institutions dealing only with small sections of the electrical engineering profession. It looked as if the proposal to form a wireless institution would be carried through. Surely the parent institutions were large enough and knew sufficient to foster the sections of the industry. He did not think there was any justification for forming smaller institutions which only tended to fritter away the strength of the industry and to divide its members when they might very much more advantageously get together and benefit each other. He felt that the duplication of papers to be read was very unwise and also, with new institutions springing up, time was demanded which it was very difficult for a busy man to give. Turning to the proposal to supply hot water to a district from a generating station, Mr. Chattock said that the capital cost of supplying water to a district was very heavy, and in addition to that there were pumping costs. He went into the matter some years ago in connection with the Summer Lane station and came to the conclusion it would be much cheaper for a householder to heat water by coal or coke. There was another proposal which had been made, to take the generating station to the pit head, but electrical engineers required water even more than coal and an enormous quantity would have to be available before economy could be obtained.

Mr. S. T. ALLEN, borough electrical engineer, Wolverhampton, submitted the toast of "The Electrical Industry." He laid stress on the value of co-operation and suggested that the time had arrived when they ought to consider and bring about what might be termed the first British National Electrical Congress. If such a gathering could be got together, representing all sections of the industry, it could review the present position and determine the best and most efficient methods of dealing with the great developments they could all foresee, so that all sections could go forward in step.

SIR T. O. CALLENDER, in reply, referred to the enormous changes and advances which had been made in the industry. He spoke of his visit to the United States, and pointed out that electricity was almost universally used in that country, not only in the large towns but also in out-of-the-way places.

A presentation of a silver fruit dish was made to Mr. Chattock to celebrate his election to the position of president of the Institution.

Mr. F. J. MOFFETT, in proposing Mr. Chattock's health, spoke of him as a member of the Institution, as an engineer, and as a man. Since his first coming to Birmingham, Mr. Chattock had been a consistent supporter of the Institution and in particular of the local Centre. Twice he had occupied the chair, and he had done much personally for the success of the Centre. The great and successful undertaking of which Mr. Chattock was the chief, was sufficient evidence of his abilities as an engineer, and as a man they would agree that while much of the success of the undertaking was due to the engineering abilities of their president, yet a considerable element had been his human side.

Mr. CHATTOCK, in returning thanks, said his work in Birmingham had been a pleasure, and it had been contributed to very largely by the wholehearted support he had received from the committee and staff of the electric supply department.

Principal GRANT ROBERTSON (Birmingham University) proposed the toast of "The City of Birmingham and Electricity Supply." He spoke of the time when electricity might do much to make Great Britain prosperous, happy and strong. He hoped that would be realised, but there were two requisites; one was that they should do nothing to prevent, and everything to promote, the study, research and teaching of science as a national duty. The second was that they had to get the public to understand what could be done for civic life if they took science seriously and then applied it in every possible way to the amelioration of civic and other conditions. In this country we had been held up by the apathy and ignorance of the general population.

Coun. C. T. APPLEBY (chairman of the Works Sub-Committee of the Electric Supply Committee) responded.

The toast of "Kindred Societies and Guests" was proposed by Col. J. F. Lister and responded to by Mr. H. E. Yerbury, deputy city electrical engineer, Sheffield.

The Annual Dinner of the Western Centre.

The annual dinner of the above Centre was held at the Hotel Metropole, Swansea, on January 11th, about 150 members and guests being present. Mr. J. W. Burr, M.I.E.E., presided, and was supported by Messrs. Roger T. Smith and J. S. Highfield, past presidents of the Institution, and Mr. P. F. Rowell, secretary.

Among the guests were: Prof. F. Bacon, M.A., Swansea, Mr. H. Spence Thomas, president of the South Wales Institute of Engineers, Mr. Martin Price, Cardiff, Sir Arthur Whitten Brown, K.B.E., Swansea, Mr. A. J. Ostler, Bristol, president-elect of the Electrical Power Engineers' Association, and a number of representatives of various electrical and engineering undertakings. Mr. R. A. Chattock, president of the Institution, was unable to be present owing to a hastily convened Joint Industrial Board meeting.

Mr. WILLIAM MORGAN, president of the Swansea Chamber of Commerce, proposed the "Institution of Electrical Engineers." He said the Institution was formed in 1871, and now had 12,000 members, including practically every prominent authority connected with the profession. They had in Mr. Burr an excellent chairman of the Western Centre.

In reply, Mr. ROGER SMITH said that the Institution's efforts had been crowned with success, and the Western Centre was the brightest jewel in its crown. "Kindred Associations" was given by Mr. William Nairn, Bristol, and in reply, Mr. SPENCE THOMAS welcomed co-operation between the Institution and the body he represented. The South Wales Institute of Engineers was only too ready to afford other institutions any facilities it possessed. Mr. THEODORE STRETTON, president of the Association of Mining Electrical Engineers, said that his Association was not a rival to the Institution, but a nursing ground for it. Mr. T. E. ALGER, president of the Electrical Contractors' Association, said that his Association fully appreciated the splendid work done by the Institution. It was the Institution of Electrical Engineers, under the able guidance of Mr. Wordingham, that inaugurated the scheme of a National Register for Electrical Contractors. At the present time it was a matter of voluntary registration only, but he was hoping that it would become compulsory for every electrical contractor to have a certificate of registration before carrying out work to be connected to supply mains. The compiling of a code of rules by the Institution for the installation of electric lighting and power had, to his knowledge, been a long and tedious process, and much valuable time had been given to it by the Committee responsible. In the past this country had suffered through the want of standardisation of electrical materials, and the code would simplify matters not only for contractors but also for manufacturers. He was pleased to note that the Fire Offices Committee had issued a list of some 90 or 100 insurance companies, which had adopted the regulations of the Institution of Electrical Engineers.

Mr. W. J. BACHE, Cheltenham, proposed "The Visitors," to which Alderman I. BARCLAY OWEN, Mr. F. G. WAINWRIGHT and others replied. "The Land We Work In" was proposed by the CHAIRMAN, who advised greater advertisement by Wales of her manufactures. It had been rightly said that the British were too prone to self-depreciation, and would advertise foreign goods which were very often the offspring of British brains.

Canadian Hydro-Electric Development.—In the field of hydro-electric power Canada has made remarkable strides. At the end of 1924 the power actually harnessed was 3,590,000 h.p., calculated on the basis of 80 per cent. efficiency and 24-hour flow. In 1925 a further 725,000 h.p. was installed, bringing the total to 4,315,000 h.p., and work upon an additional 1,100,000 h.p. is proceeding. The use of water-power is estimated to effect an annual saving of 90,000,000 tons of coal. —*Reuter's Trade Service.*

Electrolytic Disinfectant Plant.—We have received a copy of a special report on "Twenty Years' Working of the Electrolytic Disinfectant Plant of Poplar," by Fredk. Wm. Alexander, medical officer of health for that borough. A new building and plant has recently been added to the installation, and some particulars of the new equipment are embodied in the report. The plant was supplied by Messrs. Mather & Platt and consists of five 30-A Graphode electrolysers, each with eight cells and arranged for series working from the 230-V d.c. supply mains. Each electrolyser is provided with a vulcanite tank, a draw-off cock and a cooling coil. The electrical equipment comprises a 30-A d.p. reversing switch, a pressure regulator and a suitably scaled ammeter and voltmeter. The circulation of the electrolyte is maintained by the action of the electrolyser. The current is reversed periodically to ensure even wearing and cleaning of the electrodes. The total output of the plant, assuming four 24-hour runs per day, is 157½ gallons of sodium hypochlorite at a concentration of 10 grms. of available chlorine per litre, which is equivalent to approximately 300 gallons per day at the concentration of fluid distributed from the existing magnesium hypochlorite machines. With the cost of salt at £4 per ton and electricity at 2.25d. per kWh, it is estimated that the cost of the sodium hypochlorite at the above strength will be 1.6d. per gallon.

The quantity of fluid prepared and distributed since the initial installation of the old plant amounts to over one and a quarter million gallons at a total cost of £2,858, £1,575 for materials and £1,283 for electrical energy.

Electricity Supply in Great Britain.

Particulars of the Government Scheme.

On Friday last, at a meeting of the Midland Union of Conservative and Unionist Associations at Birmingham, Mr. STANLEY BALDWIN, the Prime Minister, outlined the scheme which has been adopted by the Cabinet for the development of the supply of electricity in Great Britain. He said it was known that the consumption of electricity in this country was very much less than in many countries overseas. He could not agree with those who claimed that industrial efficiency could be attained by increasing the use of electrical power; nevertheless, electricity offered great advantages to the industrialist and to the domestic consumer. Exaggerated views had been put forward on this subject; cheaper power by itself would not revive industry, for the cost of power formed but a small proportion of the total manufacturing costs. But within the next 15 years a conservative estimate indicated that the consumption of electricity, at present 200 units per head per annum, would be at least 500 units per head; and it should be possible during that period to save many millions of pounds by cheapening electricity supply. It was of the first importance that ample supplies of power should be available where they were wanted; that the sources from which it was derived should possess adequate reserves; and that those sources should be interconnected, so that any industry could be certain of obtaining power whenever it was required.

He asked whether they were to-day making the best use of the national resources. The subject was investigated some years ago by a strong Committee over which Sir Archibald Williamson [now Lord Forres] presided, which concluded that the system of generation of electricity in this country should be radically changed; the parochial system must be abandoned, and industrial consumers should be supplied from a common source, thus adding to the economy of large-scale production the advantage of improved load factor, which was of vital importance.

Briefly reviewing the history of the electricity supply industry and the recommendations of the Williamson Committee, Mr. Baldwin referred to the creation of the Electricity Commission in 1919, and outlined the work which the Commissioners had accomplished; he said that the difficulties of reorganisation which they had met with had been very great, and the present Government, with the aid of a committee of which Lord Weir was chairman, had re-examined the whole position. It was found that in this country there was an excessive number of small generating stations with high working costs, and that there were 16 frequencies in use which differed from the standard frequency. As a result of these investigations the Government had formulated proposals which would be laid before Parliament in the next Session, and which had for their purpose the improvement of the system of generating electricity. He emphasised the fact that the generation and the distribution of electricity were separate processes, each with its own problems; the former was an engineering question, the latter primarily commercial. It was not sufficient to provide a cheap supply of electricity; a good selling organisation was also essential. The distribution of electricity was already carried out on a large scale by competent organisations, such as the power companies and the big municipalities; smaller companies and municipalities were also actively dealing with the distribution of electricity to local consumers. The great need was to reduce the cost of distribution and to facilitate the formation of new authorities to undertake the supply of electricity in areas not yet covered.

As for generation, the process of concentrating all demands on large, efficient, and interconnected stations was proceeding slowly, and legislation was necessary to hasten it. The Government proposed to strengthen the powers of the Minister of Transport and the Commissioners and to set up an Executive Board covering the whole country, to establish interconnecting lines and to co-ordinate existing and future large power stations in large areas. By "Board" he did not mean a Government Department; what they had in mind was a board controlled by practical men in close touch with the industry, such as the Port of London Authority. The new Board would raise its own capital and would work on commercial lines. After it had earned interest and sinking fund on its capital, any surplus that might remain would be applied to the reduction of charges to the undertakings which it supplied.

A Government subsidy would not be required, but in order to enable the scheme to be carried out, a Government guarantee would have to be extended to it, like that given under the Trade Facilities Acts. The Board would construct interconnecting lines so that undertakers whose stations were inefficient could close them and obtain a cheaper supply from the Board's stations. The larger stations would be operated by their present owners, and future stations by those who built them, but all would work together under the Board, producing a common supply of electricity which the Board would purchase and place at the disposal of the distributors. The Board would be provided with the necessary powers to bring everybody into line, and one of its duties would be to make the frequency uniform in all the areas as they were co-ordinated. He knew that the necessity for this standardisation was not universally accepted. It was true, in the case of a non-standard area, that so long as it could remain isolated the advantages of a change-over were reduced by the cost and inconvenience of the change, but taking the country as a whole, and having regard to the anticipated rapid increase in the use of electricity, the benefits to both the consumers of electricity and the manufacturers of electrical apparatus of a single standard frequency, he was informed, were very great.

The Board would have to carry out standardisation of frequency at its own cost in all the areas as they were connected up, and they were advised that this outlay would be fully off-set by economy in generating costs. At the same time, the work of standardising frequency and constructing main transmission lines would be of material assistance to industry, whilst the outlay would be remunerative and would provide work for the electrical and allied industries.

They were satisfied that Government action was necessary to free the industry from the restrictions under which it laboured, and they believed that the scheme proposed would effect this object with the minimum disturbance to existing conditions. It was directed to the single purpose of generating electricity in the most efficient manner, and when this cheap supply was assured they believed that everyone would be able to obtain the electricity that he required.

They did not suggest that this scheme would be the salvation of industry, but every year's delay made co-ordination more difficult and expensive, and they believed that under the stress of modern competition they could not afford longer to neglect the sound organisation of power supply.

On Monday the Electricity Commissioners further explained the Government's proposal to the technical Press. We understand that they anticipate that within 15 years the annual consumption of electricity per head will increase from about 200 kWh at present to at least 500; already on the North-East coast the figure is 800, and at Rotherham it is between 400 and 500. It is hoped by the improved system to make electricity cheaper and more generally available, the latter consideration being as important as the former. The result of utilising a greater horsepower per employé in a factory is, as experience shows, a greater output and a higher rate of wages.

Out of 584 electricity supply undertakings, last year 42 produced half of the total output, at a much less cost than that of the 542 which produced the other half. The Electricity Commissioners have had data prepared for certain districts with great care, using the actual load curves, actual invested capital, estimated cost of changing the frequency, &c., and find that by concentrating generation in the best modern stations, linked up with one another, instead of in the numerous existing stations, the results would be so much improved as to effect savings sufficient to cover the cost of transmission and standardisation, and, to lower the price of electricity as well. These figures, we understand, have been checked by independent authorities, and the Commissioners are satisfied that in advising the Government to proceed on the lines set forth in the Prime Minister's speech they are proceeding on the best engineering and economic grounds.

The standardisation of frequency, a necessary preliminary to complete interconnection will, it is claimed, be of enormous benefit to manufacturers, who agree that by standardising their products and manufacturing in bulk they will be able to sell apparatus at lower cost and be better able to meet foreign competition.

An important feature of the scheme is the reduction of the heavy burden of reserve plant made possible by interconnection. Last year 68 per cent. of the capacity of generating plant installed in British works was standing by; when interconnection is complete, 10 per cent. will suffice.

There will be no interference with existing distributors, who, relieved of the task of generation, will be free to concentrate on the distribution problems arising from the new demands, for which their existing mains will be inadequate. The rights of the Power Companies to supply electricity will be respected; the Board will not deprive them of their legitimate output, but care will be taken to see that economies effected by the Board's operations shall be passed on to consumers, and the working of all stations will be controlled by the Board.

It is anticipated that many of the new transmission lines will pass through rural areas and make a supply of electricity available to them, these lines serving both as interconnectors and as supply mains.

The Board will raise its own capital with a Government guarantee, but no subsidy; during the first few years it will pay interest out of capital, and the sinking fund will be suspended. It will not be a profit-making body, any surplus being passed on to the distributors. The compulsory powers of purchase cut out of the 1919 Bill will be restored; selected stations will be retained and worked by their owners under the general direction of the Board, which will decide the load factor at which each station shall operate, so as to secure the most advantageous conditions, as is already done in certain large existing systems. It is hoped to bring about a new era with the minimum disturbance. Compulsory powers will be provided to deal with undertakers who fail to appreciate the advantages of complying with the Board's requirements.

When a cheap bulk supply has been brought about by the Board with the help of the existing stations, and accompanied by standardisation of frequency, pressure, and systems of charging, the British electrical house will have been set in order.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

An Electric Vehicle Association.

I read with interest Mr. J. C. Elvy's suggestion as stated in his letter on page 118 of your issue of January 15th, putting forward the desirability of forming immediately "an association, institution, or society, consisting of those who are interested in any way whatsoever in electric vehicles."

It seems rather strange, after all the work that has been done by various persons interested during the past twelve years, not to mention the activities of the Electric Vehicle Committee and the continuous publication of a journal specially devoted to this subject which has now reached its 98th number, that this Rip-van-Winkle-like project should be put forward. One would think that Mr. Elvy had been living on another planet.

Mr. Elvy's doubtless well-meaning proposal should be regarded, in my opinion, in the light of Mr. L. L. Robinson's recent very timely remarks anent the undesirability of redundant and quite unnecessary further institutions, associations, or societies.

The Electrical Development Association, under the able direction of Mr. J. W. Beauchamp, assisted by the *personnel* of the Electric Vehicle Committee, may very safely be left to take whatever steps are practicable to maintain and advance the interests of the electric vehicle industry.

As Mr. Elvy wishes to assist this industry, I am sure he will agree that his efforts will be best directed towards co-operating with existing Institutions.

Raymond J. Mitchell, M.I.E.E.

London, *January 15th*, 1926.

Overhead Distribution.

As Mr. Redgment is retiring from the lists after his letter in your issue of the 8th, I will not occupy much of your space. I trust, however, that in the coming developments in the district, with which I hope he will be concerned, he will remember the æsthetic considerations which have been so largely neglected by engineers.

My main point is that a pole line is essentially ugly, and if sometimes it is a necessity, it is a very unfortunate one.

If, as foreshadowed in the original article, compulsory powers are given, I do not see where the difficulty of cross-country runs comes in, as compared with roadside way-leaves. It is to be hoped, however, that whatever Government authority is responsible will prove as enlightened as the Road Board, who in their treatment of the countryside, and their consideration for ancient bridges and interesting buildings, have shown that modern needs are not incompatible with the more abstract amenities of life.

In conclusion, I would assure Mr. Redgment that I did not challenge the statement of relative costs to save myself the trouble of working out the figures, but because I had already roughly done so.

S. E. Glendenning.

Norwich, *January 16th*, 1926.

Hidden Dangers.

I trust that the leading article in your current issue will receive the serious consideration it deserves.

Apparently the Home Office electricity officials are powerless to act; therefore, may I be allowed respectfully to suggest to electricity supply authorities that they could render a public service by circularising their customers with an inexpensive "warning" leaflet. Do not wait for a fatal accident as a means of warning, which incidentally would reflect adversely on the electrical development movement.

There should be no need to convince *bona-fide* electrical engineers that the danger is real, but I may inform them that in response to a letter I wrote to the lay Press (published on December 9th last) apropos electric model railways, I have received documentary evidence of shocks and injuries received.

Taking one, for instance, the writer is resident in S.W.12 postal area, and the electricity supply is 205 volts a.c. pressure, which I believe to be the County of London Electric Supply Co.'s area.

He appeals to me to do all I possibly can "to stop this kind of diabolical toy being sold." It appears that in adjusting the rails he received a severe shock and could not release himself from contact until someone who was fortunately in the room switched off; he dreads to think of the consequences if it had been his child, for whom the toy was purchased as a Christmas present; the shock might easily have proved fatal in that case. As it was, the writer had to be treated for burns and shock to system.

Obviously the risk is still existing when the lamp is removed in view of the "earth" neutral return and the possibility of metal work unintentionally "earthed" being in the room where the toy may be erected.

J. C. Elvy.

London, *January 15th*, 1926.

Telephone Charges.

No doubt many telephone subscribers will be rather startled by what is termed "An Important Notice" in the form of a leaflet attached to their accounts, which refers to non-payments.

Amongst the contents thereof we read: "Recent investigations show that the cost entailed by temporary suspensions of the service owing to non-payment has now reached a sum of about £25,000 per annum.

The layman who reads this may gasp at such a huge sum, but the *bona-fide* electrical man who knows anything about the subject will look upon these figures as absurd, unless the operator who withdraws and replaces the plug of the defaulter is paid a specially high rate for the simple operation.

The telephone has now become a great public advantage, and should not be hampered by high and unnecessary charges.

I wonder how many business men, especially in the electrical trade, have gone into figures as to the cost of a telephone installation when they are charged £1 15s. per quarter for hire of the Exchange line.

Considering that they pay full price for all their calls, the sum is perhaps round about that of a full-blown money lender. Would not the popularity of electricity supply soon fade if station engineers so charged for their "lines"?

In my district we should be pleased to lay a great many yards of heavy underground cable to a consumer if he would pay seven pounds per annum for the hire of it, plus all he used, like telephone calls, into the bargain.

Archie Gamble.

Electricity Works, Chirk.
January 14th, 1926.

Tough Rubber Trailing Cables.

With reference to Mr. Brooking's letter on the above subject, I would state that I have been purchasing trailing cables with the earth braid fully surrounding the conductors.

However, I do not think that it is standard practice to purchase this type of cable, and many collieries are still using the type with the parallel earth wire. The fact that cable makers are manufacturing this class of cable, with the surrounding earth shield, only serves to emphasise my point that such cables are safer than the type with a separate earth wire incorporated in the cable.

As my paper was only published in extract form, it is quite possible that Mr. Brooking may have been misled.

I. Sclar.

Dunfermline, *January 11th*, 1926.

A Pneumatic Flexible Coupling.

I was very surprised to see, in your January 8th issue, the pneumatic tire form of flexible coupling described as a new idea. I would like to draw your attention to patent specification No. 123,482, and French patent 537,452, whilst as long ago as No. 21,692, of 1895, the same principles were applied between driving and driven members.

C. H. Clarke, F.C.I.P.A.

Snaresbrook, *January 13th*, 1926.

Electrical Engineering in Nigeria.

I should be extremely obliged if you could put me in touch with any electrical engineer who has had service in Nigeria.

P.T.2384 Stockton.

January 14th, 1926.

"Of the Making of Books——"

A gentleman who either acquired, or had thrust upon him, a reputation for great wisdom, on one occasion is said to have remarked: "Of the making of books there is no end." As that gentleman lived and died during the 10th century B.C. one trembles to think what he might have said had he been here to-day.

In 1920 I received an announcement from some publishers that a certain book was in the press and would be completed shortly. The approximate price would be 50s. I was invited to order, and I fell. In 1921 the first volume, price 25s., came along. In 1923 the second volume, price 35s., was delivered. In 1924 the third volume, price 55s., which no one had expected, completed the contract.

Even with this experience I hadn't learnt wisdom, for some two years ago I received a notice to the effect that yet another book was to be produced—one day. Approximate price 25s. It was a subject which interested me, and I 'phoned asking when it might be expected. The reply was "In a few months." In a few months I 'phoned again and the reply was "Early in the New Year" (1925)—they seemed annoyed at my persistence. Two weeks ago a beautiful tome came along—size outside covers 10 in. by 7.5 in. by 1.5 in.—containing less than 300 pages, price 36s. In the introduction it is remarked that while the subject was progressing it was deemed advisable to split the work into two volumes and the next would be ready shortly—or in the next New Year, or sometime, price ——? Will it, think you, be necessary further to sub-divide this volume, and let us wait yet another year?

I have some technical books averaging 1.7 inches between covers, and averaging 700 pages, price—present day, not pre-war—25s. Is it therefore necessary to double the thickness, and nearly treble the weight of paper to run up the price?

I appreciate to the full nice binding, nice paper, nice printing, and so on, but surely *editions de luxe* are unnecessary in technical books? Books without number were bad enough, but anyway one had a book. Now that it is a matter of books of limitless size, and each work a small library, I suggest that it is time to call a halt. Most technical books are out of date in quite a few years, and I suggest that publishers should not mulct the poor wretches who have to buy them further than is necessary to secure a fair return to themselves, to their printers, and, if anything is left over, to the authors.

I put this wail forward in all deference and shall be interested to hear if any other victims share my views, or if my complaint is unreasonable.

January 7th, 1926. **F. T. Fawcett.**

How Will "Government" Electricity Affect Us?

Let us take the good points of the scheme first. Unification of generating systems and a spread of transmission systems over the country is certainly desirable if it can be accomplished without increasing the cost of electricity to the public, and so far the scheme is all to the good; at any rate, it will ensure that these problems are carefully thought out.

The scheme, within a reasonable period, will provide a lot of work for the cable makers, plant manufacturers, and their employés.

The bad part of the scheme as it is presented by the Press is that it is dressed up to impress the public that they may expect immediate reductions in the cost of electricity. As usual, the public comes last; he may hesitate, expecting more favourable conditions, and so produce a slump. In my opinion, cheaper prices cannot result at once. The scheme is one which will not begin to show its effect much under 10 years, and will not be really beneficial to any large extent under 20 years.

The scheme, as presented by the Press, leads the public to believe that the cost of generation is the alpha and omega of the electricity supply business. This is by no means the case.

Let us assume for a moment that the provision of super-stations can save 15 per cent. of fuel and 20 per cent. of the plant cost, as compared with a good modern medium-sized station. Even then these advantages will be counterbalanced largely by the extra cost of transmission.

The promoters claim that the load factor on super-stations will be so large that it will counterbalance the disadvantage of high cost of transmission, but nobody has ever taken the trouble to prove this.

A few years ago I collected the whole of the load curves for the London area, super-imposed them, and thereby compared the load factor for the large area with the load factors of the individual areas. It was not materially greater.

The Government scheme appears to me to overlook the enormous importance of improving the load factor within each distributing area. This can only be done by making it possible for the consumers to use electricity for all purposes, such as water heating, lighting, heating, power, cooking, &c., quickly, instead of being satisfied with having so many consumers who use electricity for lighting only and not worrying about the other uses.

Electricity for lighting is cheap, owing to the great economy of modern lamps, even if the charge per unit is so high as 6d. or 8d. Electricity for lighting can never be supplied very cheaply, because the capital involved is used for so few hours during the year. However, if lighting is made to bear its proper proportion of capital cost and other overhead charges, as it easily can, the other uses can be supplied at extraordinarily low rates; in fact, I have several consumers using electricity for all purposes, who on our normal sliding scale get their supply to-day for less than 1d. per unit.

In my area, where we have realised the importance of sales and development, we already have one out of every 10 consumers cooking by electricity, and a consumer who cooks, heats and warms his bath-water will, without any alteration to his service connection to the main, use over 2,000 units per annum, whereas with lighting only he might not have consumed 200 units.

In the area with which I have the honour to be connected, I do not find that the cost of the electricity is the bar to large consumption. The difficulty is the cost of installation and apparatus, and I think the Government will enormously improve their scheme if they give to all undertakers full powers to sell and hire apparatus and installations, and full powers to enable them to provide large demonstration establishments for the education of the public in the proper use of electricity. Probably under the Trade Facilities Acts, the distribution and installation side of the business could have the help which is being proposed for the generation side of the business, and in my opinion it is at this end of the business that Government assistance will produce results more rapidly.

L. L. Robinson,
Borough Electrical Engineer.

Electricity Department, Hackney,
January 18th, 1926.

[Several letters have been received too late for insertion.—EDS. ELEC. REV.]

Electrical Imports of Java.

THE following statement, based on the recently-issued official statistics, shows the values of the imports of electrical and allied material into Java and Madura during 1924. Comparative figures for 1923 have also been given for purposes of comparison and notes of increases or decreases added.

	1923. Guilder.	1924. Guilder.	Inc. or dec. Guilder.
Electric lamps, incandescent.—			
Total	733,000	704,000	– 29,000
From Holland	320,000	462,000	+ 142,000
,, Germany	278,000	163,000	– 115,000
,, Japan	57,000	28,000	– 29,000
Electric lamps, other.—			
Total	194,000	116,000	– 78,000
From Holland	83,000	60,000	– 23,000
,, Great Britain	4,000	5,000	+ 1,000
,, Germany	92,000	38,000	– 54,000
Electrical apparatus.—			
Total	845,000	736,000	– 109,000
From Holland	212,000	264,000	+ 52,000
,, Great Britain	16,000	30,000	+ 14,000
,, Germany	452,000	344,000	– 108,000
,, Japan	56,000	38,000	– 18,000
,, United States	68,000	37,000	– 31,000
Electric wire and cable, copper.—			
Total	998,000	1,000,000	+ 2,000
From Holland	318,000	609,000	+ 291,000
,, Great Britain	31,000	7,000	– 24,000
,, Germany	572,000	203,000	– 369,000
,, Japan	31,000	153,000	+ 122,000
Dynamo-electric machinery.—			
Total	655,000	899,000	+ 244,000
From Holland	327,000	560,000	+ 233,000
,, Great Britain	21,000	13,000	– 8,000
,, Germany	242,000	245,000	+ 3,000
,, France	5,000	2,000	– 3,000
,, Italy	53,000	48,000	– 5,000
,, United States	3,000	28,000	+ 25,000
Other electrical machinery.—			
Total	734,000	635,000	– 99,000
From Holland	230,000	194,000	– 36,000
,, Great Britain	35,000	52,000	+ 17,000
,, Germany	383,000	308,000	– 75,000
,, United States	19,000	51,000	+ 32,000
Iron and steel wire for electrical transmission.—			
Total	145,000	325,000	+ 180,000
From Holland	16,000	138,000	+ 122,000
,, Great Britain	8,000	8,000	—
,, Germany	81,000	156,000	+ 75,000
,, United States	14,000	10,000	– 4,000

Guilder = 1s. 8d.

Reviews.

Transmission Circuits for Telephonic Communication: Methods of Analysis and Design. By K. S. JOHNSON, Member of Technical Staff, Bell Telephone Laboratories. Pp. viii + 326; illustrated. London: The Library Press, Ltd. Price 21s. net.

This volume is the evolutionary product of notes made by the author during the past 15 years. In their original form they were utilised by him during the session 1918-19, when conducting a special course for other members of the Western Electric Co., who were interested in the analytical study of telephonic transmission. In the winter of 1921-22 they were used in a series of lectures at Harvard University at the invitation of the Electrical Engineering Department of that college.

The scope of the work is "to cover the general theory and principles which are applicable to the development and design of circuits and lines for association with such telephonic instruments as transmitters, receivers, and vacuum tubes."

The reader is expected to be familiar with the elements of alternating-current theory, the operations of the differential calculus, and with the notations and operations of the "complex quantity" method of representing alternating functions.

There are in all 19 chapters and seven appendices dealing successively with the acoustical properties of the voice, ear, transmitter and receiver; measures of telephonic frequencies; circuits involving simply transmitters and receivers; simple series circuits; Kirchoff's laws and reciprocity theorem; characteristics of ideal transformers; transformer and transition losses, Thévenin's theorem and equivalent T networks; computation of transmission losses; substation circuits; treatment of passive networks as equivalent smooth lines; transmission characteristics of telephone lines; loaded circuits; telephone repeaters; resonant and anti-resonant circuits; theory and

design of wave filters; corrective networks or equalisers, and superimposed circuits. It will, therefore, be seen that the problems of transmission which the telephone engineer has to deal with at the present day have been adequately covered. Not the least interesting chapter in the book is that in which the author, in dealing with measures of telephonic frequencies, discusses the "transmission unit." Although there is much to be said in favour of the American definition of this unit, it is somewhat premature, pending the decision of the International Conference, to call it "the new transmission unit." The "βl" form has still to be reckoned with.

From first to last, the entire treatment of the subject is thorough; the reader being led gradually from the simplest line problems to those of considerable complexity, as in the case of passive networks. The increasing importance of filters has been fully appreciated by the author, who discusses the theory and design of the various types of wave filters in a clear and exhaustive manner. In fact, the clarity of exposition is one of the many excellent features of this manual—a statement which cannot be applied indiscriminately to works of this class.

The compendium of mathematical formulæ and the mathematical appendices given at the end is the most complete we have yet seen. The text is exceedingly well printed, and numerous diagrams are given illustrative of the associated subject matter.

The book will undoubtedly take its place as one of the best manuals that have yet appeared on the subject of telephonic transmission.

The Nagaoka Anniversary Volume. Pp. xvi+423; illustrated. Tokio: The Imperial University.

This volume is dedicated to Prof. Hantaro Nagaoka by his friends and pupils to mark the completion by him of 25 years' professorship, and has been in preparation, under the guidance of a committee, since February, 1921, but publication was delayed by the great earthquake in Japan. Prof. Nagaoka, who was born in 1865, took the degree of D.Sc. at the Tokio Imperial University in 1893, and as a Government student studied in Europe under such men as Helmholtz and Planck. In 1896 he was appointed to the chair of Physics at his mother University, his present post. He has received many distinctions, including that of Hon. Fellow of the Physical Society of London, in company with Mme. Curie, Lorentz, and Michelson. His scientific work has been specially directed towards magnetism and geophysics, and, more recently, radio-transmission. He is credited with being the first to propound the nuclear structure of the atom, in December, 1903, a subject in which he is keenly interested.

The splendid volume before us contains a list of Prof. Nagaoka's published papers, and a symposium of more than 40 papers by different authors on physical subjects, of which a considerable proportion deal with electrical phenomena. Amongst the latter are the following: "A sensitive electroscope," by T. Shimizu; "Electrically deflagrated mercury filament as a flash light for instantaneous photography," by K. Suychiro; "A component anemometer," by K. Fuji; "The effect of magnetic fields on electrical resistance of some alloys," by J. Obata; "Studies on dielectric hysteresis and allied phenomena," by H. Saegusa; and "The electric resistances of tungsten wires," by J. Taukamoto.

The book is admirably produced, the paper, printing, and illustrations being of the highest order, and worthy of the notable occasion which it celebrates.

Trade-Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 13th. In the case of foreign applications, the names and addresses of the British representatives are also given:—

Hush-A-Phone. New York (lettering and design). No. 457,459. Class 8. Sound-muffling devices for use with telephones.—The Hush-A-Phone Corporation, 19, Madison Avenue, New York. (Dr. A. L. Mond, 19, Southampton Buildings, W.C.2.)

Director (lettering and design). No. 459,088. Class 8. Apparatus for use in automatic telephony.—Automatic Telephone Manufacturing Co., Ltd.

Nanazo. No. 458,865. Class 8. Electric cables.—Cable Makers' Association.

Solex Signs (lettering and design). No. 459,774. Class 8. Electrical advertising signs.—Solex Signs, Ltd., Windsor House, Victoria Street, S.W.1.

Radiovim (lettering and design). No. 464,154. Class 8. Apparatus for use in radio-telegraphy and telephony.—Radiovim, Ltd., 24, The Elms, Dingle, Liverpool.

Listron. No. 464,598. Class 8. Detector crystals for use in radio-telephony and telegraphy.—G. J. Barley, 30, Ranelagh Gardens, Barnes, S.W.13.

Enoni. No. 461,832. Class 13. Electric lamps (ordinary).—Osram Gesellschaft, Berlin. (Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

Orion. No. 464,223. Class 13. Electrical fittings.—Magyar Wolfram Lampa-Gyar Kremenczky Janos Reszvenytarsasag, Budapest. (Dicker and Pollak, 20-23, Holborn Viaduct, E.C.1.)

Orca. No. 464,612. Class 50. Electrical insulating goods.—Etablissements Poulenc Frères, Paris. (Carpmaels & Ransford, 24, Southampton Buildings, W.C.2.)

Shannon Scheme Dispute Ended.—It is reported that the strike which was holding up the Shannon hydro-electric scheme has been brought to an end by a decision of the Limerick dockers to unload the steamers which are bringing materials for the scheme to the Free State.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

14,602. "Quick-acting electric voltage regulator for dynamo-electric generators." F. B. Dehn (Neufeldt & Kuhnke). June 17th, 1924. (244,803.)

14,642. "Electric discharge devices." Dr. E. F. Huth Ges. June 27th, 1923. (218,276.)

17,803. "Electrical windings." S. Z. de Ferranti. July 25th, 1924. (244,807.)

19,236. "Electrical heating apparatus." J. A. Law (W. E. Hudson). August 14th, 1924. (244,808.)

19,974. "Wireless signalling." Soc. Francaise Radio-Electrique. August 23rd, 1923. (220,958.)

21,953. "Synchronising systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Western Electric Co., Inc.). September 17th, 1924. (244,814.)

22,052. "Plug-and-socket members for use in connection with wireless apparatus." Igranic Electric Co., Ltd., A. H. Curtis, and G. F. Dandridge. September 18th, 1924. (244,817.)

22,064. "Selectors and telephone systems operating with selectors." F. Aldendorff. January 14th, 1924. (227,792.)

22,440. "Electrical fuses." H. P. L. Higman. September 23rd, 1924. (244,825.)

22,672. "Moulded battery boxes." British Thomson-Houston Co., Ltd., A. P. Young, and A. G. Salisbury. September 25th, 1924. (244,833.)

22,758. "Electro-pneumatic hammer." A. C. J. Guenee. October 6th, 1923. (222,858.)

23,779. "Means for inductively coupling electric circuits." Igranic Electric Co., Ltd., and W. K. Alford. September 26th, 1924. (244,841.)

23,310. "Controllers for electric motors." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). October 2nd, 1924. (244,850.)

23,452. "Means for locking and unlocking electric switch plugs." J. H. Gath. October 4th, 1924. (Addition to 175,794.) (244,851.)

23,960. "Control devices for electric illuminating signs." W. Ostermayer. October 9th, 1924. (244,854.)

24,491. "Electrical transforming devices and associated telephonic receivers." E. A. Graham. October 15th, 1924. (244,858.)

24,674. "Small electric arc lamps." T. C. Angus. October 17th, 1924. (244,862.)

24,699. "Method of, and means for supporting electrodes in thermionic valves and the like." W. R. Bullimore. October 17th, 1924. (244,864.)

24,921. "Electric welding and the like." G. B. Ellis (T. E. Murray). October 20th, 1924. (244,866.)

24,967. "Manufacture of thermionic valves." W. J. Pattison, A. J. Holyoak, and W. L. Turner. October 21st, 1924. (244,867.)

25,058. "Loud-speaking telephones and like sound-emitting and converting apparatus." British Thomson-Houston Co., Ltd., A. P. Young, and J. H. Butcher. October 21st, 1924. (244,868.)

25,351. "Contact drums for electric controllers." Igranic Electric Co., Ltd., and C. F. Tubbs. October 24th, 1924. (244,871.)

25,663. "Circuit arrangement for transmitting current impulses in automatic telephone exchanges." Siemens & Halske Akt.-Ges. and M. Langer. October 28th, 1924. (244,874.)

26,294. "Insulator bushings for switchgear and other electrical apparatus." British Thomson-Houston Co., Ltd., H. C. Heath, and H. E. Cox. November 4th, 1924. (244,878.)

26,352. "Variable inductance devices." E. W. Hovenden. November 5th, 1924. (244,879.)

26,400. "Construction of multiple-way coil-holder for wireless telegraphy or telephony." E. T. P. Kerridge and F. W. Trendell. November 5th, 1924. (244,880.)

26,595. "Automatic circuit-breakers." Crompton & Co., Ltd., and W. F. Jones. November 7th, 1924. (Addition to 199,526.) (244,885.)

27,762. "Lead or like metal-sheathed electric cables." British Insulated Cables, Ltd., and J. L. Packer. November 20th, 1924. (244,889.)

28,568. "Process for regulating the speed of alternating-current machinery." British Thomson-Houston Co., Ltd. November 28th, 1923. (225,564.)

29,094. "Electromedical appliances." C. A. Baker and J. Bell & Croyden, Ltd. December 4th, 1924. (244,901.)

29,099. "Wireless distributor boards." W. H. Bushell and J. Merrett. December 4th, 1924. (244,902.)

30,155. "Selective protective apparatus for electrical circuits." Akt.-Ges. Brown, Boveri et Cie. December 15th, 1923. (226,240.)

30,365. "Electromagnetically-actuated electric switch mechanism." Commanditaire Vennootschap Froger's Electriciteits Maatschappij. January 19th, 1924. (227,810.)

30,898. "Means for establishing or breaking the connection of two electric conductors." J. D. Coenraads. January 5th, 1924. (227,101.)

31,124. "Telephone table sets." F. Merk. December 13th, 1924. (244,389.)

31,165. "Advertising and electrical testing device." General Electric Co., Ltd., and J. F. Turner. December 29th, 1924. (244,917.)

1925.

131. "Process for the manufacture of articles in fused silica, more especially intended for electro-technical uses." Quartz & Silice. October 30th, 1924. (242,214.)

172. "Device for hermetically sealing electric leading-in wires in a glass wall." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 23rd, 1924. (234,441.)

506. "Sound-emitting devices." British Thomson-Houston Co., Ltd., and A. P. Young. January 7th, 1925. (244,926.)

2,402. "Gaseous electric space current device." American Appliance Co. March 1st, 1924. (230,026.)

3,071. "Electric cables." W. T. Henley's Telegraph Works Co., Ltd., and W. W. Watkins. February 3rd, 1925. (244,944.)

4,554. "Testing apparatus for sparking plugs." H. J. C. Forrester (Wankmueller & Co. Ges.). February 18th, 1925. (244,949.)

4,750. "Apparatus for improving the power factor of induction motor combinations." British Thomson-Houston Co., Ltd. February 26th, 1924. (230,054.)

5,741. "Process for the manufacture of large crystals." General Electric Co., Ltd. May 26th, 1924. (234,449.)

6,490. "Terminal connector." Brandes, Ltd. (M. C. Rypinski). March 10th, 1925. (244,962.)

6,771. "Suspension insulators." British Thomson-Houston Co., Ltd. (General Electric Co.). March 12th, 1925. (244,965.)

7,061. "Telephone table set." F. Merk. February 9th, 1925. (244,968.)

8,586. "Incandescent cathodes for discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenbrieken. April 8th, 1924. (232,201.)

10,592. "Protective arrangement for alternating-current generators." Siemens Schuckertwerke Ges. April 24th, 1924. (232,972.)

10,975. "Electric insulators." G. V. Dowding and K. D. Rogers. April 28th, 1925. (244,981.)

13,588. "Floor-levelling devices for electric elevators." Waygood-Otis, Ltd. June 18th, 1924. (235,858.)

15,681. "Electric oil switches." International General Electric Co., Inc. August 8th, 1924. (238,194.)

15,819. "Electric lamps." S. D. Angelo. June 18th, 1925. (245,008.)

15,982. "Inductance coils for use in wireless systems." F. Hasnip. June 20th, 1925. (245,010.)

16,664. "Electric protective devices for the discharge of high potentials." British Thomson-Houston Co., Ltd. September 5th, 1924. (239,491.)